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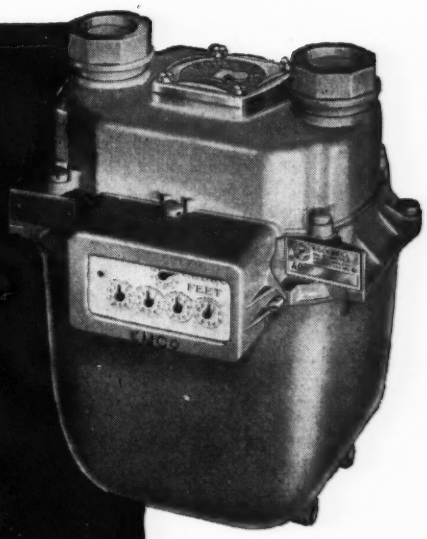

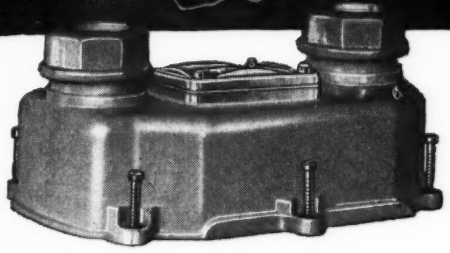

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EASIER TO HANDLE—The improved Rockwell No. 0 meter is lighter and easier to handle. That's because of the aluminum alloy body and cover. Actual weight is only 18 pounds—less than one-half that of any cast iron meter. This lighter weight saves effort on the part of those handling meters. It saves important dollars in transportation costs.

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WRITE FOR BULLETIN NO. 1100

ROCKWELL

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27TH YEAR OF PUBLICATION GAS

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IN THIS ISSUE

D. A. HULCY and H. Carl Wolf line up with convention queens at the Home Service Breakfast, theme of which was "showboat." For other news and pictures of the St. Louis AGA convention, see page 37.

Thermally Thinking

the editors

Who Is Responsible?

THE LINES OF COMMUNICATION from gas utilities through dealers, plumbers and the like, to their customers are of varying degrees of looseness—varying among utilities. The classic example of the extreme of looseness is, as is now well known, Consolidated Edison Co. of New York, which each day delivers a bundle of Btu's to its customers' doorsteps, and like the unwed mother depositing her unwanted offspring on the handiest porch, gets the heck out of there.

The great majority of companies, happily, is moving steadily toward closer relationships with customers and dealers through stronger control of sales and servicing. Whether through dealer cooperative plans and schools for dealers, or under policies of direct merchandising and servicing, they are tightening up the reins and winning new friends for gas.

But how strong are company policies on appliance installation? Is this superior fuel being improperly utilized in jerry-built lash-ups installed by uninformed or indifferent servicemen?

Art Theobald, chief engineer for Sequoia Manufacturing Co. of San Carlos, Calif., and at one time chief research engineer for Payne Furnace Co., is strongly concerned by what he feels is a gap in the lines of communication from utility to installer. In a recent letter to *GAS*, he set down his observations as follows:

"The industry during the past ten years has made great strides through the expenditure of many thousands of dollars for research in the advancement of technical information for the design engineer, which could be of extreme value to the ultimate consumer *if* the information were passed on to the parties responsible for the final installation, adjustment, and operation of the equipment in a language they can understand.

"The manufacturer spends several thousands of dollars each year through engineering and development of new equipment and obtaining approval by the AGA Laboratory. As we all know, a very slight alteration in this construction may completely upset the entire operation, yet this equipment is distributed throughout the entire United States and put in the hands of installers who, due to lack of opportunity, have no idea what the AGA seal of approval stands for or what is necessary to obtain the approval.

"This ignorance of AGA requirements is not restricted to the installer or service man. It is also found in architects and city building inspectors. To my knowledge, the city of Los Angeles is unique in requiring AGA descriptions of approved appliances. In three years in a Texas city, as far as I could find out I was the only holder of a "Directory of Listed Appliances," not to mention a detailed description or prints of the appliances.

"In one instance a Payne draft hood, which is listed by the AGA as an approved appliance and is approved with the Payne CB furnace, was installed on a Payne CB furnace in the manner prescribed. Yet the installation was turned down by the city inspector, because the local utility company had rejected it. Their reason was they had never seen one like it and didn't think it would work. Yet the installation would have been approved with a makeshift open-end tee as a draft hood, or a cone-type draft hood with the skirt resting on top of the furnace. In fact, I inspected one new furnace installation with no draft hoods that had been approved by the city and was in operation.

It's Nationwide

"I have travelled around the country and inspected installations with service men who are trying to make the gas appliance meet the expectations of the customer, and found this condition is not restricted to this city, but is rather general. The alteration of appliances is looked on with little regard, and changes are made to meet most any condition. In Oklahoma, Royal Jet-Flo heaters were installed with openings to heat the living room, dining room, and kitchen on the first floor and two bedrooms on the second floor. No ducts were used, the floor joist being lined with asbestos paper to perform the function of ducts. The vent was offset to get into another partition, which necessitated cutting off the top of the draft hood, which included the baffle and the relief opening. The result was that the 3-in. tube off the heat exchanger was connected directly to the vent.

"In many cases the fan switch and limit control is moved, sometimes to place it in a more accessible location and sometimes because the service man is not able to get the functioning *he* desires without changing the location. Some standard practices are the use of a wall heater as a gravity furnace with the installation of ducts, and the use of overhead unit heaters as duct furnaces.

"We are all familiar with the engineering bulletin published by Purdue University reporting research on venting gas appliances, and most of us have it in our library. Yet it is worth little when a great many of the architects, mechanical engineers, city building inspectors, installers, and even some of our utility personnel are not aware of the publication. Some are not interested as long as they get by. Abuse of the principles of gas appliance venting is going on day by day.

"In one particular case when I pointed out a bad condition to the mechanical engineer in charge of design on a portion of the school buildings in El Paso, he told me that was the way he wanted it. The installation had 40 ft of horizontal vent connection with no rise, four 90° ells connecting a 17,000-Btu wall heater to a concrete chimney 12 ft high and 18 in. square, serving a boiler with a capacity of approximately 800,000 Btu.

"F. O. Hess has very pointedly saddled the manufacturer with the responsibility of building the best possible appli-

ance, and the utility with the responsibility of supplying the gas quality to enable the appliance to perform to its ultimate; yet both can be completely defeated by a pair of tin snips and a piece of tin in the hands of a service man or installer who has not been given the opportunity to obtain a true picture of the meaning and work that goes into the obtaining of an AGA approval.

"Placing the proper information in the hands of the parties needing it is no small job, yet there are several ways in which it can be done—and effectively, too, so that they will value it and make use of it rather than set it on the shelf and continue on in the present manner.

"Regardless of how much money is spent on research, developing new equipment, testing, or the type gas served, the satisfaction of the appliance is measured by its performance in the customer's home. All the foregoing can be wrecked in five minutes by lack of understanding. *Who is responsible?* The easy out is to pass the buck to the dealer, but he does not know the publications, would not understand them if he read them in the language in which they are written, and in lots of cases would not read them if he did understand them without some inspiration to do so. It is that inspiration that the entire industry must stimulate. *"Who is to carry the ball?"*

"Disintegrated Integrated Industry"

PARAPHRASING a piece of Washington gobbledygook, "unprogrammed program," which he says "means just what it says," C. P. Rather, assistant deputy administrator for PAD, has created a new label for the gas business—"a disintegrated integrated industry."

What Mr. Rather was pointing out, in a speech before the Independent Natural Gas Assn. of America in Oklahoma City recently, was that pipeliners, royalty owners and producers, and distributing companies, all of which combine to form an integrated industry, are the several components which seem to be flying apart in a "disintegrated" fashion.

"In many respects this is healthy," said Mr. Rather. "To a certain extent it works toward the public good." But sometimes very heated arguments lead to violent statements, accusations, and involvement of personalities, which easily find their way into public print.

What can be done? he asked. "Must this disintegrated integrated industry pull at cross purposes, give false impressions, load its critics' guns, fail to properly value the other parts of itself, fail to let the public know the importance it has to it and otherwise stand in its own light? Or will it put its best foot forward and get some real understanding of itself and its component parts?

"I think it will follow the latter course."

But the latter course does not mean a "collusive effort . . . to bilk the public," nor an acquiescence by the pipeliner or the producer to the other's price, no matter how unreasonable. Nor does it mean that the distributor shall no longer be vigilant as to what it pays for gas, assuming that it can be passed on to the public; nor that there should be no more competition for new markets.

It means, simply, that every part of the industry should be more temperate in its dealings with the other segments.

This solution at first blush seems so general and basic that it may appear meaningless. But examine a timely instance of the need for such a solution . . .

Down in Texas, producers and royalty owners have banded together into a strong organization known, quite naturally, as the "Texas Independent Producers and Royalty Owners Assn." Judging from the tone of their official organ, "The Tipro Reporter," the nature of the association is that of a protective group. Issue after issue depicts with printed word and clever cartoon the perpetual battle the producers wage against gas pipeline companies. To the outsider, this obsession would appear to add up to a persecution complex. To TIPRO, pipeliners are skulking thieves bent on robbing the producer of his daily bread.

So suspicious are officers of the association that when all-important bills S-1000 and HR-3793 were introduced in Congress they immediately assumed that the motive behind these bills was not to provide vital storage of natural gas for peak loads, but to almost literally move Texas' gas fields to the North and the East.

Let's Move a Gas Field

As is well known to distributors and pipeline companies, S-1000 was introduced by Paul Douglas of Illinois to give gas companies the right of eminent domain to condemn geological strata for the underground storage of natural gas. Passage of a similar measure in the senator's home state has already given Peoples Gas subsidiaries the right to develop a project that is vital to the welfare of the public, its customers.

TIPRO, however, looks upon S-1000 as a deliberate move by pipeline companies to take all the Texas gas at "present prevailing prices, and store it in the east for speculative purposes," to sell it back "some time in the future at considerably higher prices through the same pipelines."

Such lack of understanding between these two segments of the industry is appalling. If TIPRO's fears had any foundation, it would be disgraceful. But even the existence of such fears is a frightening example of what Mr. Rather calls "disintegration."

Recently, some progress was being made toward an agreement. TIPRO took cognizance of the need for "some storage facilities" and proposed an amendment to the Natural Gas Act to "place a reasonable limitation upon the amount of gas which may be stored by pipeline companies operating under a certificate of necessity from FPC." Subsection (f) of Sec. 7 would be changed to provide "that the amounts of gas which may be stored from year to year shall be limited to such amounts as the commission finds reasonably necessary to assure an adequate and continued supply during critical peak periods when normal deliveries are not sufficient to meet peak demand."

TIPRO wasn't too happy with its amendment, but at least it took the "decision" out of the hands of "those who would have no hesitation in transplanting unlimited quantities of Texas natural gas."

That's progress toward agreement all right, but not toward *understanding*. Sounds more like a cease-fire.

Let's Talk It Over

J. J. Hedrick, president of three Peoples Gas subsidiaries, in a talk at the INGAA meeting, mentioned the amendment and explained TIPRO's interpretation of S-1000. "This concept of gas storage is entirely new to me," he declared.

However, perhaps his next words may presage a true understanding: "We have been talking recently with representatives of TIPRO and have arranged for a conference to see if they can be convinced that the bill is all right as it now stands, or to arrive at some amendment that would satisfy them and still accomplish the purpose for which it was designed."

Mr. Hedrick also said that so far as his companies were concerned, "we have an eminent domain law in Illinois and are perfectly happy with it, but I think for the good of the industry the industry should get behind S-1000 and support it to its ultimate passage . . ."

When Peoples Gas subsidiaries, which already have their law, go out of their way to support S-1000, they're showing their respect for true *integration*.

Technical Trends

guy corfield

Benzene Supply is Critical

BENZENE (also called benzol), the first member of the aromatic hydrocarbon family, is of historical as well as production interest to the gas industry inasmuch as its first isolation or discovery in 1825, by Faraday, was in "illuminating gas." Benzene has for many years been of increasing commercial and industrial importance not only as a solvent but also because a great many essential chemical compounds and products are derived from it. In our present economy it is not only essential but in critically short supply, and a significant percentage of available new plant construction materials is being allocated to increase its production.

The benzene requirements for 1951 are estimated at a minimum of 232 million gallons. The principal uses will be to produce

Styrene	82	million	gals.
Phenol (synthetic)	50	"	"
Nylon	25	"	"
Aniline	16	"	"

If mobilization continues it is further estimated that our requirements in 1955 will be 400 million gals.

The sources of benzene are coke oven distillation of coal, imports, coal hydrogenation, and petroleum cracking. Coke ovens yield about 170 million gals. annually and this may be expanded to not more than 190 because, while some new coke ovens may be built and coke oven gas may be more completely processed for removal, the increasing distribution of natural gas will reduce the overall production of coal gas. Imports are now at the rate of 40 to 50 million gals. per year, but this is an uncertain supply as the shortage is world wide.

Coal hydrogenation is technically feasible but not economically attractive at this time, as the process is expensive in both money and critical materials for plants and it would take several years to develop significant production. The best new sources will be through the petroleum route from napthenic gasoline stocks.

The petroleum industry is now producing benzol at the rate of 17 million gals. per year and presently planned plant construction will raise this to 81 million gals. per year. The production from petroleum is done by catalytic reforming processes such as platforming, which entail such formidable-sounding reactions as dehydrogenation, hydrocracking, and isomerization, and which not only produce high yields of benzene but also convert portions of the original stock to gasoline of considerably higher octane rating.

Development of Inventions

THE MAIN PURPOSE of our patent structure is to promote the revealment of new ideas and developments so that they can be a benefit to society, by granting the inventor a 17-year period of protection during which he can enjoy the right of exclusive exploitation or guaranteed share in the profits or benefits. However, because of the relatively complicated procedure of making a patent application, and the considerable difficulty and expense and technical and legal "knowhow" required for developing the idea into profitable commercial production, and the fear of being deprived of the benefits by technicalities, many ideas and inventions remain unrevealed or are acquired and suppressed by selfish interests or otherwise mishandled. For an individual, or a company, or even an industry, the various complications arising out of patent applications, procedures, developments, and protections are becoming more and more involved.

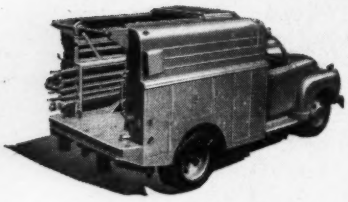
Just recently a very interesting step has been taken by Sinclair Oil Corp. whereby this corporation has opened the facilities of its multi-million dollar research laboratories at Harvey, Ill. to independent inventors who believe they have an idea or development of value to the petroleum industry. Quoting from a recent article in *Petroleum Refining* of June 1951, which in turn quotes P. C. Spencer, Sinclair president, and E. W. Isom, chairman of Sinclair Research Laboratories Inc.:

"It is the intention of the laboratories to seek out people with ideas, whoever and wherever they are. Nowhere is there a monopoly on ideas—the best may spring from the most unexpected quarters. A man and an idea are no longer enough to move our technological machine. There must be a third and fourth factor today—facilities and money."

Under the plan, ideas for better petroleum products or applications will be solicited, provided that each is first protected by a patent or patent application by the inventor. After consideration, the most promising will be put through every phase of analysis, developing, and testing that may be necessary to prove its commercial or scientific value. In most cases arrangements will be made with the inventor so that in return for its investment of money, time, facilities, and personnel, Sinclair will have the opportunity of using the invention free of royalties. It is stated that this will not, however, prevent the inventor from selling the idea to others or making full use of it himself.

A more general approach to the problem of appraisal and development of patentable and promising inventions is made by the Institute of Inventive Research which is associated with Southwest Research Institute of San Antonio, Texas. The Institute of Inventive Research was founded in 1946 through an endowment from Tom B. Slick as a non-profit public service institution by development of inventions, to create a dynamic endowment for support of fundamental research, and to assist inventors in development and marketing of outstanding new ideas. In implementing these objectives, the institute has undertaken development and management of a wide variety of patents and inventions ranging from new methods of seismic exploration to novel building construction techniques.

UTILITY WORKHORSE-



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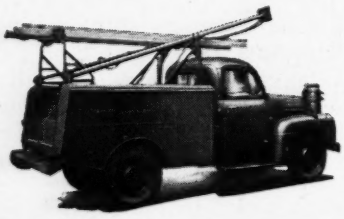

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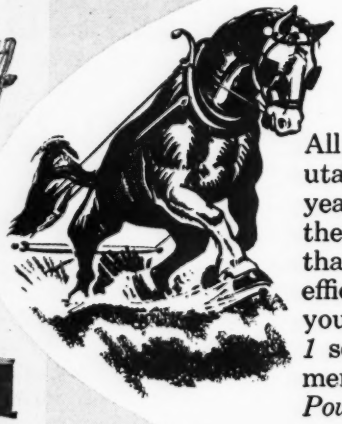

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R. W. Otto, president of the host company, emphasizes a point to President Hulcy as new President George Mitchell looks skeptical.

Scene at Kiel auditorium, convention headquarters, as Monday throng lined up to register.

Government-Business Relationships Probed At 1951 AGA Convention

Attitude of resignation toward drift into statism condemned by Hulcy . . . "Government and business must work together," declares C. P. Rather . . . Round table group explores best short cuts to expediting business with defense agencies . . . "Past erratic record of industry" called deterrent to investors . . . Interconnected pipelines and manufacturing plants envisioned by Hess . . . Housing outlook seen as favorable by building association executive . . . National public relations program under consideration.

THE accelerating interest of government in business and business in government, viewed against a background of half-war, guns and butter, encroaching statism, and spiraling costs provided the spark which made the 1951 AGA annual convention, held Oct. 15-17 in St. Louis, one of the outstanding in the association's history.

When retiring President D. A. Hulcy and C. Pratt Rather, deputy administrator for gas of the Petroleum Administration for Defense, completed the first two addresses on the three-day meeting, delegates knew that the tone of the convention had been established—the intermeshing of government and business in a defense economy.

"It was because of the freedom in which the free enterprise system was developed in America that in due course the American people outstripped the rest of mankind in productivity, and consequently in wealth," declared the president. "In this freedom, we in America have been demonstrating to the rest of mankind how good a living can be gotten out of the earth. Are we now to abandon this system and adopt in its place an alien system, the prime condition of which is that we must surrender our freedom?"

Mr. Hulcy was calling for a more positive and active approach to the problem. He saw danger in the complacency and resignation of too many of our business heads today.

"It is commonplace knowledge that the living standard of the American people is higher than that of any other people on earth," he said. "As a matter of fact, this knowledge is *too* commonplace. We feel that it ought to be higher, just as a matter of course.

"I am afraid that too many of us have fallen into this habit of complacency with respect to this matter. I am afraid that most of us who say that our free economy is menaced, and that the high standard is in danger of a decline, don't really believe it.

"I have heard good men, men with everything at stake, say in a weary tone of voice that we are headed straight for socialism in this country and that there isn't a thing we can do to stop it. I wonder if they realize what they are saying.

"If they did, where do they think they acquired the wisdom and prophetic power to justify their conclusion that there isn't a thing we can do about it. No, such men are intellectually and morally lazy, they just can't be bothered with the responsibilities of being worthy Americans in these critical times."

"Government and business must

HONORS

Winners of 1951's gas industry kudos were tendered their medals at the AGA convention. Shown making the presentation in four of the photos is Mr. Gasman himself, D. A. Hulcy.

1. DISTINGUISHED SERVICE AWARD. Hiram J. Carson, first vice president, Northern Natural Gas Co., Omaha, received the association's highest honor for his "outstanding contribution to the advancement of the gas industry." Mr. Carson pioneered in dehydration, hydrogen sulfide removal, and development of all-welded large diameter pipelines. Mr. Carson was elected first vice president of the company a year ago.

2. HOUSE HEATING AWARD. Sponsored by Coroaire Heater Corp., second prize in this fifth annual competition went to E. E. Boegli, South Carolina Electric & Gas Co., Charleston. Mr. Boegli, winner of two previous awards, received $250 for his sales promotion and educational program.

3. HOME SERVICE ACHIEVEMENT. Five winners each received a bronze plaque and $200 in cash in this competition, sponsored by "McCall's." From left, they are Kathleen Atkinson, Providence (R. I.) Gas Co.; Dorothy F. O'Meara, Bridgeport (Conn.) Gas Light Co.; Mildred R. Clark, Oklahoma Natural Gas Co., Tulsa; Eleanor Morrison, Michigan Consolidated Gas Co., Grand Rapids; and Barbara F. Haller, Ohio Fuel Gas Co., Columbus.

4. HOUSE HEATING AWARD. Top Coroaire prize of $500 went to H. F. Carr, assistant manager, appliance and residential sales, Consolidated Gas Electric Light & Power Co. of Baltimore, for developing a successful promotion in the face of an intensive competitive campaign.

5. AIR CONDITIONING AWARD. For their contributions to air conditioning progress, three utilities won Servel-sponsored awards. Roger A. Gordon, director of sales, Washington (D. C.) Gas Light Co., is shown accepting the $500 first prize for his company. Other winners were Ohio Fuel Gas Co., Columbus, $300, and Council Bluffs (Iowa) Gas Co., $200. The Washington utility was cited for a complete and effective program on all phases of the sale, promotion, and advertising of gas summer air conditioning. A comprehensive sales planning program won the honor for Ohio Fuel, and the Council Bluffs company took third prize for the excellence of organization of its sales and service structure for gas summer air conditioning.

6. AGA-SERVEL REFRIGERATOR AWARD. Representatives of a dozen utilities cited for top sales performance during the silver anniversary gas refrigerator campaign accept wall barometer trophies. They are (left to right) : O. A. Barrett, Central Indiana Gas Co., Muncie; J. W. Owen, Central Florida Gas Corp., Winter Haven; S. S. Thomas, Natural Gas Co. of West Virginia, Pittsburgh; F. N. Seitz, Southern Counties Gas Co., Los Angeles; J. A. Reynolds, Brooklyn (N. Y.) Union Gas Co.; R. J. Vandagriff, Laclede Gas Co., St. Louis; W. Paul Jones, president, Servel Inc., who made the presentation; W. L. Hutcheson, Manufacturers Light & Heat Co., Pittsburgh, chairman of the AGA gas refrigeration committee; Frank H. Trembly Jr., Philadelphia Gas Works Co.; G. F. Edwards, Atlanta (Ga.) Gas Light Co.; J. L. Hall, Southern California Gas Co., Los Angeles; C. L. Byers, Southern Union Gas Co., Dallas; and E. J. Prince, Chattanooga (Tenn.) Gas Co. Frank S. Flesher, who accepted a trophy for Florida Public Utilities, West Palm Beach, was not present when the photograph was taken.

In addition, certificates of merit for outstanding gas refrigerator sales were awarded to these 19 companies: Boston Consolidated, Bridgeport Gas Light, Brockton Gas Light, Brooklyn Union, Kings Appliance Corp., Ohio Fuel Gas, Florida Home Gas, Old Colony Gas, United Gas, Watauga Valley Gas, Lynchburg Gas, Milwaukee Gas Light, Mobile Gas Service, South Atlantic Gas, Philadelphia Gas Works, Keystone Gas, Manufacturers Light & Heat, San Diego Gas & Electric, and Worcester Gas Light.

work together" was the conclusion of the gas industry's head man in PAD. Said Mr. Rather, formerly president of Southern Natural Gas Co.:

"There is criticism, from some sources, of industry men in government, but I am prepared to stand or fall on this statement: 'God help government, and industry too, if this sensible alliance is not maintained.'

"The gas industry has been called upon to help government. It has a patriotic duty to do so, and it has a selfish interest in seeing that men who know something about the industry are doing the job so that the job will be well done."

Along more specific lines, the operating procedures under which government and business can work together were explored in a panel session, which was conducted at the windup meeting Wednesday of the natural and manufactured gas departments, in which industry and PAD-men discussed "Expediting Gas Industry Business With Government Defense Agencies." Led by F. M. Banks, president and general manager of Southern California Gas Co., Los Angeles, as moderator, the group included Walter E. Caine, A. Dale Green, Louis C. Sonnen, and J. R. Wolfe, all gasmen serving in PAD, and the AGA's George H. Smith, assistant managing director who is now devoting full time to the Washington office.

Mr. Smith was equipped with a prepared paper, detailing activities of his office. "Just now," he said, "our principal objective is to further the defense program. We attempt to help individual members with their important applications for priority assistance, filing them and tracing their progress through our claimant agent, the Petroleum Administration for Defense."

The comprehensive scope of the general sessions gave a good balance to the program and assured jam-packed audiences in the Kiel auditorium, where all meetings were held.

On Monday morning's calendar, the talk of P. P. Stathas, senior partner in Duff & Phelps, public utility analysts of Chicago, gave some new angles on the popular theme of "The Investor's View of the Gas Industry." Growing recognition by investors of the fantastic growth and financial opportunities in the business has been acknowledged in past addresses by such figures as Mr. Stathas, and pointed to with pride by men within the industry, but the speaker gave the industry reason to pause and reconsider its position when he said:

"In the light of the tremendous change which has been brought about by the magic spell of natural gas, the past trends of the gas industry are probably of no particular significance at the present time. The investor's long memory of your distant past erratic record, however, makes him pause now in your period of plenty to determine as best he can the probable amplitude and duration of this new favorable phase."

As examples of possible danger points, Mr. Stathas pointed to the present regulatory procedure whereby the industry is selling a "premium fuel at a discount, particularly for househeating purposes," which causes the investor to wonder whether the rise in prices of competitive fuels is actually a blessing from the long-term standpoint.

Mr. Stathas also expressed his dismay over the fact that "only a few distributing companies have sinking funds which will retire even as much as half their debt by maturity in 25 years or so."

"This presents a question in the minds of investors," he said. As the existing debt approaches maturity, the amount not retired by sinking funds will have to be refunded, and maturities of outstanding bonds frequently run to within a few years of the visible life of the gas reserve as now known."

The thought-provoking policy of the F. O. Hess speeches also took a new twist in the retiring GAMA president's talk, aptly titled "Speaking of Gas. Strictly Gas," a feature of the third general session. In this instance, he was making a plea for "an exhaustive study, aimed toward integration of our gas fuel supply system, correction of some of its growing ills and pains and intended to safeguard our gas industry as well as strengthen it—strengthen it beyond normal growth along established channels and practices."

Specifically—

"Our various pipelines might be extensively interconnected to provide greater flexibility, interconnected all the way from Kansas City eastward all the way to New England and down to Tennessee. True, this would involve problems and cooperation, investment and coordination, but progressive aims have never been stopped by such hurdles.

"Concurrently, we might explore and seriously investigate the possibility of auxiliary gas supply from the eastern half of the U. S.—to help our winter load problems, the industrial gas requirements, to help our combustion problems and our appliance and service situation.

"Just suppose, in strategic points of our integrated fuel pipeline system, near our immense coal reserves, we were to construct large gas plants—or 'conversion and standby plants.'" Through this setup, Mr. Hess proposed that uniform, interchangeable gases could be sent out from Mississippi to the Atlantic seaboard.

• conventionally speaking

The sections managed to squeeze a lot of discussions into three days. As usual, the residential gas section's program was the most spectacular. Props included a coffin, which Frank Seitz of Southern Counties, Los Angeles, wheeled out to bury the industry in if it doesn't sell "automatic," and a bushel basket of matches which James I. Gorton, GAMA's CP promotional director, booted into the audience as the climax of his "Automatic Is the Buy Word" presentation . . . "Automatic is the buy word, the sell word, the profit word, the dream word, the magic word, the wishing well word" was his theme.

Same meeting: Irving K. Peck, vice chairman of the general promotional planning committee, gave a rundown on what's cooking promotionally. He reported 22 TV shorts and six films are on the way under the national TV setup . . . gas appliances are being used in 90% of the movies today . . . educational materials are being developed (in the past, requests from schools and other institutions could not be completely filled) . . . Utility tie-ins with national promotions have been spotty. Only 125 tied in with the Early Bird campaign, although 500 are in the Old Stove Round Up . . . Five utilities have dropped their support of PAR because of *present market conditions* ("How shortsighted!") . . . Bernice Strawn of *Woman's Home Companion* gave a rundown on the heart kitchens promotion . . .

Eight industry experts gave eight viewpoints in "Evaluating the Budget Payment Plan," a highlight of the accounting section's customer activities group meeting. It was a joint presentation of the customer accounting committee, customer collections committee, and customer relations committee.

Leon Ourusoff, Washington Gas Light, wasn't sure the word "progress" belonged in the title of his paper, "A Progress Report on the Commercial Cooking Competitive Situation." He outlined for the industrial and commercial gas section the results of a survey made among 30 gas companies representing more than 11 million customers, to determine progress made in the past year, competitively. Some gains have been made, some alarming losses have been made, he showed. He asked for stronger participation by more gas companies in programs now being undertaken by only a "handful."

Herman Koester Jr. of Wellesley Hills, Mass., described available sales aids and told how they should be used. "Use the services of trained manufacturer's representatives," he said. "Attend the AGA schools over and over again; study process heating applications in plants in your own territory; make use of association handbooks and publications, stay close to regional associations, use manufacturers' catalogs and AGA technical facilities."

A feature of the home service round table was Mary E. Huck's "Hot Water Playhouse," a puppet show put on by the Ohio Fuel Gas Co. for home economics classes.

EXCHANGING ideas at St. Louis are (left to right) L. J. Eck, Minneapolis Gas Co.; R. D. Lewis, Laclede Gas Co.; C. C. Young and F. M. Rosenkrans, Gas Service Co.

OHIO FUEL GAS CO.'s Paul W. Rogers (left) gave the report of the motor vehicles committee, of which he is chairman; Irving K. Peck, Manufacturers Light & Heat Co., spoke to both the operating and residential gas sections; and A. H. Cramer (right), Michigan - Wisconsin Pipe Line Co., gave a report as chairman of the corrosion committee.

L. F. WORTH, sales manager, dryer division, Bendix Home Appliances Inc., during "Time's A'Wastin'," a presentation put on at the Oct. 17 joint luncheon by Bendix and Hamilton Manufacturing Co.

E. H. EACKER, president, Boston Consolidated Gas Co. and new AGA vice president, chats with Walter E. Caine, gas planning division director for PAD, a member of the panel which discussed expediting business with defense agencies.

Harry K. Wrench of Minneapolis Gas Co., whose sound rate theories and load equation methods are well recognized, explained his company's operating policies in another general session address titled "A Dependable Supply of Fuel for Industry."

"The Outlook for Housing in 1952" was described in a paper by Frank W. Cortright, executive vice president of the National Assn. of Home Builders, Washington, who concluded his address with an analysis of how the gas industry can work with builders in these critical times to solve problems affecting both their own interests and those of the entire nation.

"Your national association and ours must cooperate on the national level," he declared. "And beyond that, there must be a similar cooperative activity on the community level."

"The Development of Management Executives," by B. B. Gardner, executive director of Social Research Inc., Chicago, pointed out the difficulties of finding capable and well rounded men needed for executive positions.

"This difficulty does not lie in the lack of men of potential executive ability. There are as many bright and able men as ever. But the rapid growth of industry, and the increasing complexities of the executive's job have made it more difficult to find sufficient men ready for top positions."

"There's Nothing Like a Dame" was the way Clara Zillesen, formerly advertising manager of Philadelphia Electric Co., summed up her sex. Miss Zillesen's sprightly talk analyzed female psychology in such a way as to give executives a better insight into the way their distaff customers can be approached.

A comprehensive study of "Baltimore's First Year With Natural Gas" by Charles P. Crane, president of the utility, gave detailed coverage of rates, loads, financial problems, and accomplishments.

Chicago's progressive gasman and business leader, James F. Oates, chairman of the Peoples board, made a strong case for public relations—including in his talk a consideration of a national public relations program. In view of the fact that the less-than-adequate job being done by a few companies is adversely affecting the entire industry and that the AGA is moving toward the formulation of such a program made his talk particularly timely.

Mr. Oates' talk, in its way, helped to tie down on a working basis the theme that Mr. Rather, Mr. Hulcy, Mr. Hess, Mr. Cortright, and the PAD panel were pointing out:

The gas industry within itself and with those bodies which have a community of interests simply must buckle down and work together.

convention comment

. . . excerpts from four addresses presented at last month's AGA meeting . . .

Outlook for Housing

"As we look ahead to 1952, it is of great importance to examine Defense Mobilizer Charles E. Wilson's recent statements as to the assignment to this industry. Last June, this official stated that home building next year would be 800,000 to 850,000 units, which is the target for the year 1951. More recently, in his "Third Report to the President," it was indicated that we should build a volume equal to the average of the years 1946-49, which average was 861,000 units.

Because of this, we are planning to build about 850,000 units next year, barring some totally unforeseen developments which would permit an increase in this volume or necessitate a reduction. As an industry, we are convinced that an annual housing volume of at least 1 million units is essential to the welfare of the country.

The fact is that our population is increasing at an astonishing rate. The Bureau of Census has recently estimated that by 1960 our population will reach 180 million persons, an increase of 26 million over our present population. Since the average household consists of 3.1 persons, a minimum need of 9 million homes during this period is required.

It is the small American builders, those who have accomplished the outstanding 1946-51 building record, with whose problems we are presently concerned as we undertake to prognosticate the industry's volume of production for 1952. It is they who will have the problems of manpower, finance, materials, and sales.

Insofar as manpower is concerned, both skilled mechanics and labor, no very serious problems seem to be ahead. Money and materials, of course, are the two really great problems with which they will be faced.

It is our guess that the greatest problem ahead will lie in an inadequate supply of copper and steel for housing under the Controlled Materials Plan. Not only are we greatly concerned with the availability of "A" products, consisting mainly of pipe, nails, and wiring, but with the "B" products, the manufactured metal items for which there are no satisfactory substitutes at this time and the lack of any one of which will bring the construction of houses to a standstill.

The fourth factor, merchandising, should not be serious.

Your great national association and ours must confer and cooperate on the national level. We must jointly attack the problems posed by the allocation and distribution of metals and of gas itself in this regulated and controlled economy of the emergency. In addition to demanding our place in the sun, we must be concerned with economies and greater achievements to meet the industry's indisputably serious problem caused by the shortages of copper and steel. A first step will be the appointment by you of a technical committee to cooperate with the technical and research committees of our association, and I strongly urge such action.

—Frank W. Cortright, executive vice president, National Assn. of Home Builders.

AGA in Washington

"Just now, of course, the principal objective of the AGA's Washington office is to further the defense program. Within the limits of our capacity to do so, we attempt to help individual members with their important applications for priority assistance, filing them and tracing their progress through our claimant agent, PAD.

Many companies have their own representatives come to Washington to pursue their applications and appeals, but many depend on our office to save the time and expense of such trips. We can probably be of some assistance to all members but, particularly, we have acted as the agent of the non-represented companies and will be glad to continue the practice until the burden gets too great.

The office has acted as the medium for organizing committees of experts from the industry to argue our cases before defense agencies . . . It functions daily in giving information to members of PAD's staff, who are processing applications, to explain the essentiality and relation of parts of important applications.

The office functions as a ready service to the defense agencies and others on questions of the size and importance of the gas industry and these constant contacts keep the industry in the minds of responsible government people.

The office functions also to procure informal interpretations of government defense orders and regulations for our members and, in that way, the identity of the inquirer remains unknown. There is considerable advantage in keeping interpretations informal because, once they are formalized and an answer given in writing by a government official to a direct question, the entire industry is stuck with that interpretation for the duration.

Our prime purpose is to provide cor-

GEORGE SMITH, shown with the panel of PAD experts, explained the workings of AGA's Washington office, particularly its dealings with government agencies.

rect factual data concerning the industry and its needs. No lobbying or influence pressures of any kind are engaged in. We do endeavor to keep in touch with events in Washington of interest to the gas industry, to keep calendars of legislative and commission hearings on important matters, to assist in the preparation of material for hearings where it has been decided that the industry should be heard, to alert the industry on matters of urgency, and to keep it generally informed of what is going on. We maintain contacts with other associations located in Washington and supply them with information about gas and the gas industry when such information is helpful.

The office functions to make contacts and appointments for company members with personnel of various government agencies to discuss their local problems, such as public housing installations.

—George H. Smith, American Gas Assn., Washington

Training Management

"In considering the problem of executive development, the present nature of the top management job must be clearly recognized. With increasing complexity and rapid rate of change the top executive must make decisions involving more and more complex factors. Furthermore, with increasing size of organizations there has been an increasing degree of specialization within, so that top management must organize and direct and integrate groups of specialists who know more and more of their specialty and less and less of the overall aspects of the business. Thus the top executive must use and coordinate the activities of groups who know much more about their specialty than he can know. At the same time, he must know enough about their specialty to fit them properly into the total organization.

In many organizations we find that the conditions stifle rather than encourage the development of leadership ability. We see organizations in which all decisions are made at the top, where no one does anything except carry out orders. There are other organizations which build elaborate systems complete with standard procedures, rule books, etc., to cover every contingency. And in such organizations the junior executives and middle management never make any significant decision without "clearing it with the boss." These organizations do prevent anyone making any mistakes.

If an organization is to develop real executives to fill its future needs, it should examine several things.

First, does it provide the kind of atmosphere which will stimulate executive growth? Is it too pervaded with rules which replace thinking? Is there too much autocratic control? Is it too complacent and sure that it knows all the answers? Is there extreme emphasis on the need for extreme executive specialization?

Second, what kind of executive talent does it need? What will be the replacement or growth needs in the next few years? What kind of persons will be needed in terms of background, training, personality and ability?

Third, does it have undeveloped talent within the organization? Are there good men lost in specialized jobs? Is there ability which can be brought out with proper training? If there is such latent talent then there must be a plan for its development and utilization.

Fourth, what kind of training or development is needed? Will simple job rotation be adequate? Usually not unless the individual is very alert to add to his knowledge from all sources. Are outside educational sources available and can they be used effectively? How far can specialization be carried without ruining the man for top executive functions?

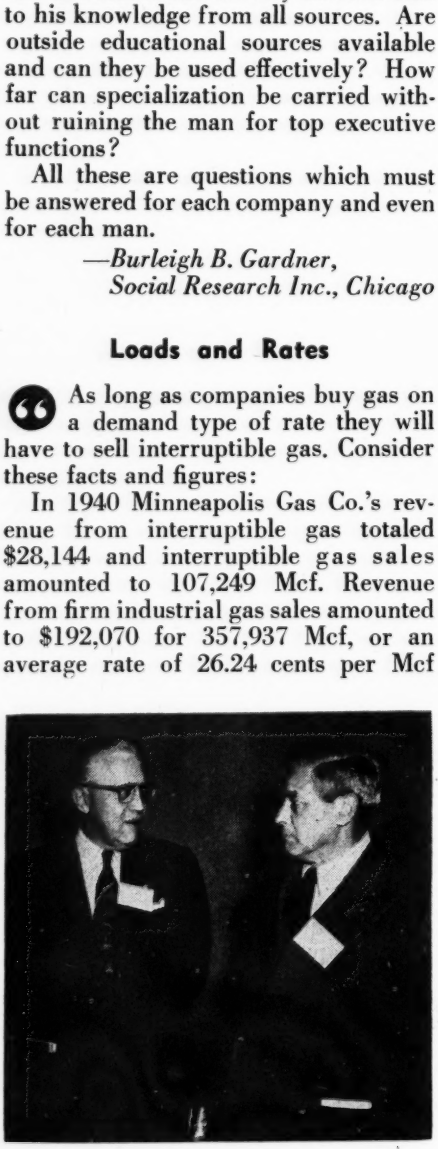
All these are questions which must be answered for each company and even for each man.

—Burleigh B. Gardner, Social Research Inc., Chicago

Loads and Rates

"As long as companies buy gas on a demand type of rate they will have to sell interruptible gas. Consider these facts and figures:

In 1940 Minneapolis Gas Co.'s revenue from interruptible gas totaled $28,144 and interruptible gas sales amounted to 107,249 Mcf. Revenue from firm industrial gas sales amounted to $192,070 for 357,937 Mcf, or an average rate of 26.24 cents per Mcf for interruptible gas and 76.62 cents per Mcf for firm industrial gas.



H. K. WRENCH, president of Minneapolis Gas Co. (right), talks with C. H. Gueffroy, president of Portland (Ore.) Gas & Coke.

In 1950 sales of interruptible gas were 11,865,333 Mcf, which produced a revenue of $2,539,245 or an average rate of 21.4 cents per Mcf. Firm industrial gas sales had increased to 1,022,813 Mcf, which produced revenue of $552,941 or an average rate of 54.06 cents per Mcf. Total industrial sales increased from 357,937 Mcf in 1940 to 12,888,146 Mcf in 1950, while industrial revenue increased from $220,215 in 1940 to $3,092,186 in 1950.

When I say firm industrial gas, I mean just that. We have never had to interrupt our firm industrial customers, and we have no intention of doing so any more than we would expect to interrupt gas service to a domestic heating customer. Because of purchasing gas on a demand-type rate, we take on in addition to our firm industrial load and our domestic and commercial load enough house heat load to use up all our demand when the temperature falls to zero.

When the temperature falls below zero we produce gas necessary for our additional load. We have maintained our gas plant so we can produce 25 MMcf of all gas per day when necessary. We at all times keep in stock something over 2 million gals. of oil for this purpose. In addition, we have constructed four propane plants and carry in stock 2.2 million gals. of propane. Last year our demand totaled 135 MMcf per day. Our peak day sendout was 153 MMcf, so it was necessary to produce 18 MMcf of gas, in addition to what we received from the pipeline, to take care of our entire domestic load plus our firm industrial load. In Minneapolis we have an average of ten days per year in which the mean temperature falls below zero. Our firm industrial business produces a load factor of 50%. To produce the gas necessary to carry the firm industrial load on peak days adds one-half cent per Mcf to the cost of our house heat gas on a year's basis.

We take on as firm industrial load all processing loads that our industrial department can sell. We do not take industrial heating loads as firm loads. We take up to 5-hp steam boilers firm.

What did all this get us? Well, our gas sales increased from 4 MMcf in 1940 to 30 MMcf in 1950. Our operating revenue increased from $5.6 million in 1940 to $14.8 million in 1950, while the average selling price of gas decreased from 11.66 cents to 4.94 cents per therm and our net return from operation before fixed charges increased from $1.5 million to $2.1 million in 1950.

—H. K. Wrench, president, Minneapolis Gas Co.

Let's Integrate Pipelines With Manufactured Gas Plants

In which F. O. Hess, retiring GAMA president, suggests a revolutionary plan for physically unifying the gas industry east of the Mississippi.

SALES policies, merchandising and advertising campaigns—as important as they are for subsistence—are, in the long range, under the influence of research and development, of ingenuity and of far-reaching plans for supply and quality of performance. Research might, therefore, well deserve a greater portion of our attention.

The very scope of our industry demands we do not consistently fall behind the national average expenditures for research. The proven need for research in a technical, progressive society, appears to be, at present, about 3% of the total business volume; or, for our $2 to $3 billion industry, approximately $100 million dollars annually. Let us frankly admit that such an amount is many times in excess of the research expenditures and efforts of the entire gas industry.

Exhaustive Study Needed

We might well make an exhaustive study aimed toward integration of our gas fuel supply system and correction of some of its growing ills and pains, and intended to safeguard and protect our gas industry as well as strengthen it—strengthen it beyond normal growth along established channels and practices.

For instance, our various pipelines might be extensively interconnected to provide greater flexibility—interconnected from Kansas City eastward all the way to New England and down to Tennessee. True, this would involve problems and cooperation, investments and coordination; but progressive aims have never been stopped by such hurdles. Since the results would be beneficial to the public, the national welfare, industry in general, and the gas industry itself, even legislation should offer no obstacle.

We know of the tremendous benefits the electric interconnecting and looping systems provide—against failures and peak demands, to balance load factors and distribute cost. Why not gas? We have the advantage of storage, something not as yet solved for electric current. We do sell the same commodity and we do speak the same language.

If five European nations, each with a different language, each with a different economy, and each in a different stage of economic development, can get together and jointly build an integrated electric power system, we should be able to manage similar progressive steps in our land, in our industry.

It will require leadership, but an industry capable of our recent growth and strength, conscious of its basic greatness, and with a desire to live rather than to exist, to work and progress rather than to retire, has that leadership and can command that leadership. It will take team work and team action, but the responsibilities of our industry today are nation-wide, not just local, and therefore obligate us to industry-wide coordination and consideration.

Auxiliary Eastern Supply

Concurrently we might explore and seriously investigate the possibility of an auxiliary gas supply from the eastern half of the U. S., to help our winter-load problems, our industrial gas requirement, our combustion problems, and our appliance and service situation. This appears like a wishful dream, contrary to facts and conditions and without realism. But maybe we can learn a little from the bumblebee:

> According to the theory of aerodynamics and as may be readily demonstrated through laboratory test and wind tunnel experiments, the bumblebee is unable to fly. This is so because the size, weight, and shape of its body, in relation to the total wing spread, makes flying impossible.
>
> But, the bumblebee, being ignorant of these scientific truths, goes ahead and flies anyway—and makes a little honey besides.

Maybe we could go ahead too—and make a little money besides.

Technologically, we have advanced far enough to know that we can make gas from coal, gasoline from coal, and oil from coal. We also know, from wide experience, that we do not have enough natural gas or gas lines in the East and

Adapted from the paper, "Speaking of Gas—Strictly Gas," which Mr. Hess presented at the AGA annual convention in St. Louis, Oct. 15-17.

North, and *if* we had we still would face the problem of disproportionate summer and winter load, of storage and even of burning characteristics of all the various mixed gases, oil gas, and pure natural gas.

Just suppose, in strategic points of our integrated fuel pipeline system, near our immense coal reserves, we were to construct large gas plants, or more correctly let us call them *conversion* and *standby* plants. These plants might be basically designed for the following functions:

1. To produce a gas containing hydrogen to be mixed at all times with the natural gas in the pipeline system—to augment supply and improve burning characteristics; to unify the Btu content and combustion performance, as well as prepare the distribution system for standby supply.

Under such a setup we would now distribute in our integrated grid system, from Kansas City east, a mixed gas of, let us say—by way of illustration only—800 Btu per cu ft containing 20% hydrogen. With it we could make *really* interchangeable standby gas, and we would have it uniform throughout the area, from the Mississippi to the Atlantic seaboard. This unification would be one of the prime purposes and in itself would result in immeasurable benefits to the industry, to the appliance manufacturer, and mostly to the consumer.

2. These conversion plants would also have to provide standby capacity (of our interchangeable gas) to keep up with demand as the natural gas supply decreases with cold weather, and to supply the increased demand of our winter load. This would maintain a 100% load factor on the natural gas lines, the variations in consumption being made up and taken up by our huge, mechanized and automatic conversion-standby plants.

3. Excess plant capacity could be used for making gasoline, especially during summer months when gas demand is low and gasoline requirements high.

4. Oil could also be made during summer to possibly serve as concentrated raw material and storage for winter peak standby demands.

The basic concept of the operation is thus not more coal gas plants, or standby plants, or gasoline plants, or local facilities, but more in the order of statewide transformer and generating stations *plus*. The utilities would still buy metered gas from pipelines, the same as at present, that principle having been established and practiced and legally accepted.

Costs Are Relative

True, gas might cost more than it costs at present piped from Texas or Louisiana; so might oil or gasoline produced in these plants. But does not above or underground storage of gas cost money; does not lack of flexibility put a premium on our gas price and our appliances; and do not additional pipelines used at low load factor increase annual average cost? And who would put a value on gas shutoffs and inadequate supply for existing demand, on goodwill or loss of it, or on the ultimate cost of governmental or state regulations and restrictions?

And besides, such conversion plants could make hundreds of other very valuable chemical materials which, when processed under controlled and quantity production conditions, would more than assist in paying for the overall operation. Let us bear in mind that large, very profitable chemical companies have, as their foundation, just such coal processing and coal by-products. For example, I. G. Farben continued to sell gas to the Ruhr and coke to the steel industry, and made "a little honey" on tar and coal derivatives; England has just announced and is proceeding with a $20 million project.

Our own chemical and oil industry has made further progress in coal, tar and hydrocarbon research and conversions. The chemical products could therefore very well represent "the little money besides," because these plants would be located in the midst of our consumer markets, even close to the export market. They would be assured operation all year around, not being single purpose conversion plants. And they would have a ready market for their coke and sulphuric acid—two of the major supply problems of our steel industry.

Fantastic? Not necessarily any more of a "pipe dream" than our fuel distribution system of today was a short 25 years ago.

Costly? Sure, but every major pipeline costs from $100 to over $200 million, and also has an amortization, operating, and compression cost.

Risky? Maybe, but only in an economic sense, and probably not even then! Does not our $10 billion industry justify a risk? Can we answer our pressing industry problems without taking risks? Is it not one of the basic concepts and functions and tasks, even responsibilities of our enterprise system, to take calculated risks?

Uneconomical? Only a thorough, coordinated research study of all technical and economic aspects could provide the answer to this, the only fundamental question.

It would require the cooperative efforts of experts in the respective fields of gas making, of coal hydrogenation, of chemistry, of coal mining, of the oil industry, and so on, and we have such experts. Such a study would involve time and money, but industry-wise we are spending hundreds of thousands to survey pipelines, and millions to promote their financing. Why would a few hundred thousand dollars expended in such a research investigation of (mind you) existing technologies not be a worthwhile investment?

And if such a cooperative study and investigation should result in a favorable report, can we doubt our ability to finance the projects or to operate them? Is it not a part of our obligation to protect our customers, to protect their investments and ours, to progress and solve our problems, and to substantiate our faith in the future of gas? Perhaps by such cooperative self-help of far-reaching benefits, not only to our own gas industry but the public at large, we can safeguard our private utility and gas systems and avoid further regulation of supply and distribution by federal or even state legislation.

Might it not assist to conserve our vital natural resources, revitalize our coal regions by efficient utilization of the dormant wealth of our coal deposits and thereby, in its impact, help in the solution of one of the social problems of our times? From the coal industry we could expect wholehearted cooperation and support—I know.

Manufacturers Are Allies

Yes, research of major proportions is a fundamental need of our industry —research which keeps pace with the financial investments and the fuel system these huge investments have already begun to create. Research which will stimulate development of uses—rather than restrict applications—research which will foster new and improved appliances and promote the creation of new gas home devices. Would not such research be better than continuing to drive manufacturers into competing lines of products to maintain operations—to fulfill their economic function, their life task, namely: to manufacture useful, *saleable* products?

The gas appliance industry has performed well during the past period of growth—considering all factors—but it could serve immeasurably better and contribute more if given fullest opportunity—if encouraged instead of restricted—if operating and planning for uniform, progressive conditions. Our phenomenal growth has begun with the tapping of but one of the reserves of the gas industry—natural gas reserves in the ground. Let us tap now our many *other* reserves through enlarged and courageous research and coordination.

Let us also engage much needed help and experience from a dwindling supply of manpower, and an appalling and acute shortage of technical skills—let us attract engineers and scientists to our gas industry by challenging projections of future growth and expansion through research.

Let us live up *to* the future of the gas industry by planning and providing *for* the future of the gas industry.

Classification of pressure regulators by types and analysis of each type on the basis of characteristics which make it fit or unfit for the job it must do.

SELECTING A REGULATOR

By ALLEN D. MacLEAN

Mr. MacLean, chief engineer of Chaplin-Fulton Manufacturing Co., is now on leave with the Maritime Commission in Washington.

SINCE the first use of gas as a domestic, commercial or industrial fuel, the control of pressure has been an extremely important consideration. Without pressure control, efficient utilization and accurate measurement are impossible. Over the years there have been developed many types of regulators and designs of control equipment to insure a constant pressure. These vary from simple weight-loaded regulators to the rather complicated instrument types of control. Other designs have utilized springs, lever and weight systems, controlled pressure loading, and many other arrangements to solve the pressure control problem.

Exclusive

To the writer's knowledge, there has never been an attempt made to analyze and group the various types of controls or the factors which make them desirable or undesirable for any specific application. The object of this discussion is to group the various applicable types of controls and to compare them with respect to their various operating characteristics which govern their selection for any given job.

• As a guide to selection of the right regulator for the right job, Mr. MacLean has developed a handy table, which appears as Fig. 1 on p. 51.

In selecting a regulator of the proper type and size, the principal factors to be considered are as follows:

1. Accuracy of control required.
2. Safety features.
3. External installation conditions, such as protection afforded, possibility of dissipating external bleeds, etc.
4. Service and maintenance requirements.
5. Adaptability to various conditions.
6. Capacity.

Each situation will require a review of the above listed factors to obtain the best type of regulator for the installation.

One difficulty encountered in studying the past literature on pressure regulators is the fact that terms or nomenclature have not been standardized. The terms here used and defined are not intended to be a standard, but are at least explained in order to group the various types.

Design Possibilities

In the many regulator designs used, there are numerous ways of arranging the valves, as well as numerous types of valves used. For instance, there can be single valves, balanced or double valves, or even slide type and rotary valves. There are variations in the manner of connecting the final actuating diaphragm and the valve, and also variations in many other features. The most important factor, however, which differentiates between designs is the *method of loading* the regulator and positioning the valve to the proper opening so as to maintain a constant reduced pressure. Practically all the essential operating characteristics of a given regulator design are dependent upon the loading and valve positioning factors.

Loading Methods

The term "deadweight" is used to describe the simplest method of loading a diaphragm, in which a weight is applied downward immediately against a diaphragm to balance the controlled pressure. The outlet pressure can be varied merely by changing this weight. *Fig. A* illustrates this type.

The "spring loaded" type is shown in *Fig. B.* Here a compressed spring exerts its force directly against the diaphragm to oppose the controlled pressure. By means of a screw, the compressed length of the spring can be changed to vary the outlet pressure.

The "lever and weight loaded" system utilizes the leverage principle to produce a greater force to counteract the diaphragm pressure and thus obtain higher outlet pressure ranges than are possible with the spring or deadweight type. This system is shown in *Fig. C.*

Constant Pressure Loaded

In the use of pilot regulators to pressure load a diaphragm, there are several important design variations available. One of the simpler pressure loading systems is shown in *Fig. D.*

To replace loading by deadweight, spring, or lever and weight, this design uses a small regulator operating on intentionally small pilot flows to counteract the controlled pressure on one side of a large flexible diaphragm with an accurate constant pressure on the opposite side. The constant pressure pilot loading regulator will maintain a constant pressure on the main diaphragm; the fixed orifice limits the volume flow of the pilot gas and also provides a pressure difference across the orifice itself, which also exists across the main diaphragm.

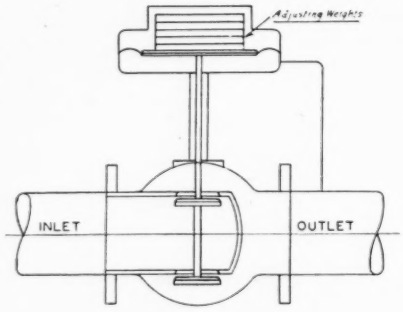


Fig. A. Deadweight loading.

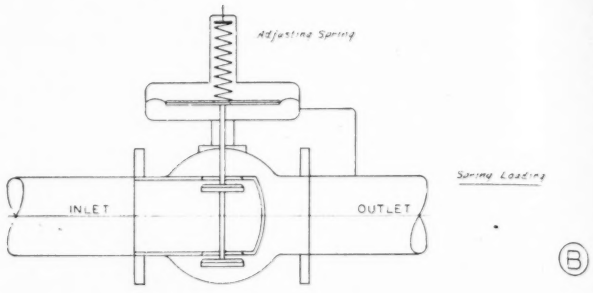


Fig. B. Spring loading.

To balance this pressure difference a spring is provided acting opposite to the loading pressure. A safety pilot unloading regulator (relief valve) is provided so that if the controlled pressure, due to failure of the pilot loading regulator, tends to increase above normal, this increase will be limited to the setting of the safety unloading regulator. This will be the maximum outlet pressure possible in case of failure of the pilot loading regulator.

In the simpler forms of loading such as deadweight, spring, or lever and weight, atmospheric pressure exists on one side of the diphragm and the controlled outlet pressure on the other. The difference of these pressures may be high and a stiff diaphragm of small diameter will be required, thus limiting the obtainable accuracy. In the pilot loaded regulator "D," the pressure difference will be slight, permitted the use of a large, highly flexible diaphragm resulting in a higher degree of accuracy.

In "D" the spring force is opposed to the loading pressure. A variation in design is shown in *Fig. E* where the spring acts in the same direction as the loading pressure. In "D" if the main diaphragm ruptures or leaks excessively, the main spring will then close the valves to stop the flow. If this should occur in design "E," the spring will force the valves wide open. The type of operation desirable will depend upon the gas system to which it is applied. In "E" since the loading pressure is lower than the outlet pressure, the pilot gas must bleed to atmosphere instead of the outlet lines, as is possible in "D."

Thus, we designate the system in "D" as "Pilot Regulator, Constant Pressure Balance Loading, Reverse Acting, Spring Opposes Loading."

The system in "E" is designated as "Pilot Regulator, Constant Pressure Balance Loading, Reverse Acting, Spring Acts With Loading." The term "balance loading" means that the controlled outlet pressure is on one side of the diaphragm and the loading pressure on the other. Where the loading pressure exists on one side and atmospheric pressure on the other side, we use the term loading without the modifying word "balance."

Variable Pressure Loaded

The forces acting in a regulator are somewhat complicated by two factors; first, the dynamic or velocity effect of gas flowing through the orifices; second, the variation in effective area of the diaphragm. The first of these results from the actual impact of the flowing gas on the valves. After the gas expands through the seat orifices it impinges on the valve discs, particularly the valve which is in the outlet zone of the regulator, effecting an unbalancing force. The second effect, the variation in effective area of the diaphragm as it moves through its stroke, has been discussed in previous articles.* Even with large flexible diaphragms it causes some unbalance of forces as the valves change their opening. Consequently even with a constant loading pressure, these two factors cause some variation in the outlet pressure.

To avoid this variation, another type of pilot control regulator is employed as shown in *Fig. F.* A second diaphragm in the pilot regulator is provided to which is connected the outlet or controlled pressure. Any change in the controlled pressure is reflected not only on the main regulator diaphragm but also on the pilot regulator diaphragm, thus varying the loading pressure; in this way the loading pressure can be and will be varied to maintain the outlet pressure constant. The unbalancing effect of the flow through the valves and the variation in effective area of the main diaphragm can be cancelled by a variable loading pressure. This makes for a higher degree of accuracy in control.

In *Fig. G* we employ the same variable pressure loading regulation as in "F" but here we have arranged a spring so that it acts in the same direction as the loading pressure. Thus as in "E," should the pressure equalize on both sides of the main diaphragm the spring will force the valves to the wide open position. Bleed gas must be led to the

*See *GAS*, October 1949, page 34.

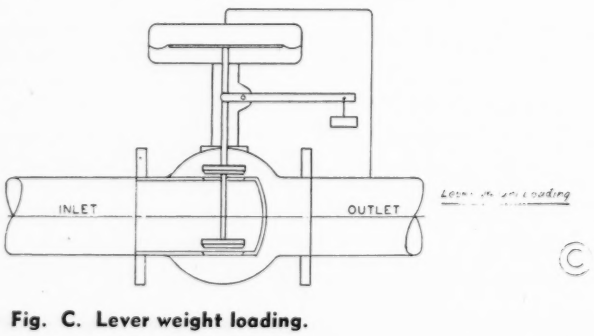


Fig. C. Lever weight loading.

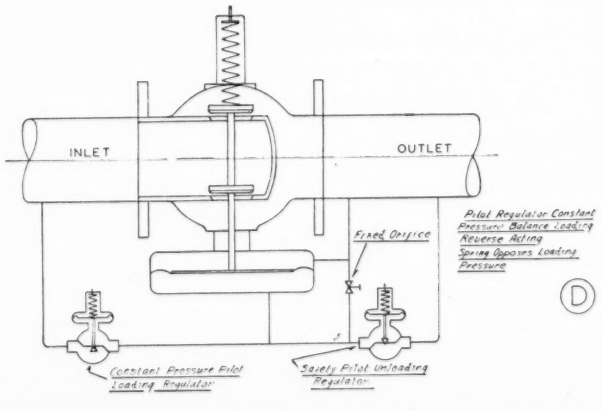


Fig. D. Pilot regulator, constant pressure, balance loading, reverse acting, spring opposes loading.

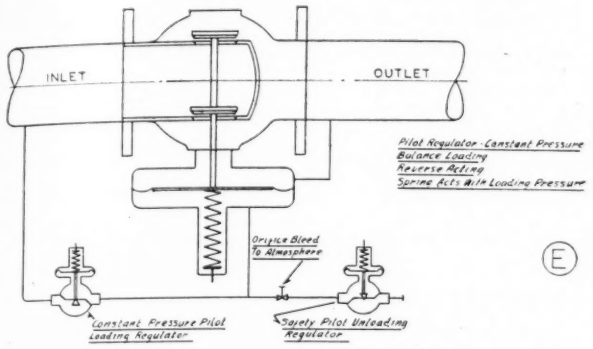


Fig. E. Pilot regulator, constant pressure, balance loading, reverse acting, spring acts with loading.

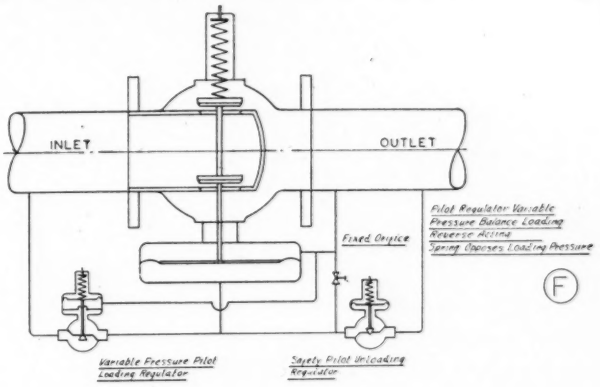


Fig. F. Pilot regulator, variable pressure, balance loading, reverse acting, spring opposes loading.

atmosphere instead of to the outlet pressure system.

The system shown in "F" we designate as "Variable Pressure Balance Loading, Reverse Acting, Spring Opposes Loading."

The system shown in "G" is designated as "Pilot Regulator, Variable Pressure Balance Loading, Reverse Acting, Spring Acts With Loading."

So far in our analysis of pilot systems we have "constant pressure loading" from a simple pilot regulator; "variable pressure loading" from a specially built pilot regulator, which to maintain a constant control pressure can vary the loading pressure. We also have "spring acting with the loading pressure" and "spring acting opposite to the loading pressure." A further variation is the term "direct acting" as against "reverse acting." By direct acting is meant a loading pressure, either constant or variable, which on increase tends to close the main valves and on decrease allows the valves to move toward the open position. By reverse acting is meant a system in which the increase in loading pressure tends to open the main valves.

A further variation is shown in *Fig. H*, where the valves are so arranged that an increase in loading pressure from the variable pressure pilot regulator tends to close the valves. The spring is so arranged that it acts opposite to the loading pressure. It should be noted that, with this arrangement, if the outlet pressure tends to increase, as it acts directly on the main diaphragm it tends to open the main valves which would further tend to increase the outlet pressure.

However, the outlet pressure acts on the control diaphragm of the variable pressure pilot loading regulator and in increasing tends to open the pilot regulator valve and load the main diaphragm to a higher pressure, thus tending to close the main valves and decrease the outlet pressure. In this way we have two varying forces acting to oppose each other; however, the second force, being widely variable, can easily overbalance the first and maintain a constant outlet pressure.

The system shown in "H" is called "Pilot Regulator, Variable Pressure Balance Loading, Direct Acting, Spring Opposes Loading Pressure."

The system in *Fig. I* is called "Pilot Regulator, Variable Pressure Balance Loading, Direct Acting, Spring Acts With Loading Pressure."

In "I" we have varied the spring arrangement so that it acts with the loading pressure as in "G"; this arrangement must exhaust the pilot gas to atmosphere instead of the outlet system.

Continuing our studies of types of pilot loading systems we come to another widely used system shown in *Figs. K* and *L*. In "K" we have a final control pilot regulator in which the pressure to be controlled is under the diaphragm. A pilot flow is established from the inlet side and then through a loading regulator, on through the fixed orifice, through the final pilot control regulator, and on to the outlet. Downstream from the fixed orifice but upstream from the final control pilot regulator, a lead is taken to the main diaphragm to load it. A lever and weight system opposes this loading pressure since only atmospheric pressure exists under the diaphragm. Any change in outlet pressure changes the valve opening in the final control pilot regulator and thus changes the loading pressure on top of the main diaphragm since the flow through the fixed orifice is constant. It should be noted that the pressure loading of the main diaphragm is not a balanced pressure since atmospheric pressure, not the con-

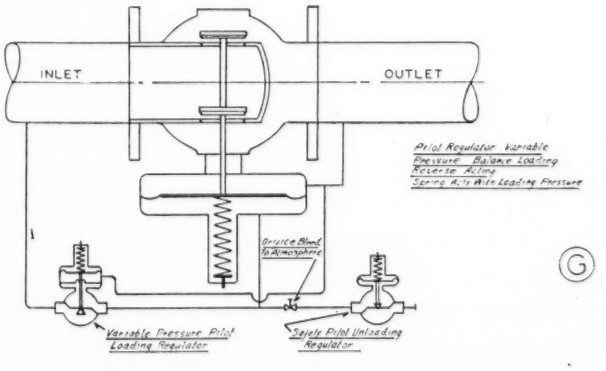


Fig. G. Pilot regulator, variable pressure, balance loading, reverse acting, spring acts with loading.

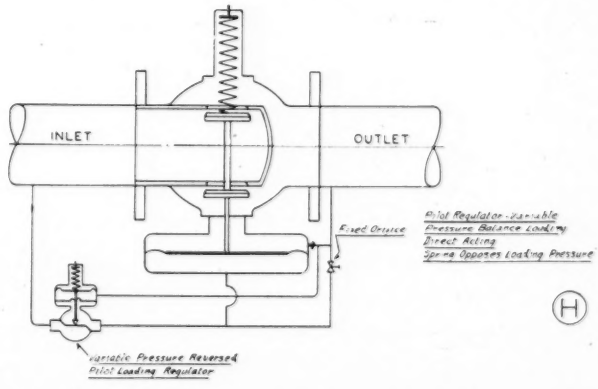


Fig. H. Pilot regulator, variable pressure, balance loading, direct acting, spring opposes loading pressure.

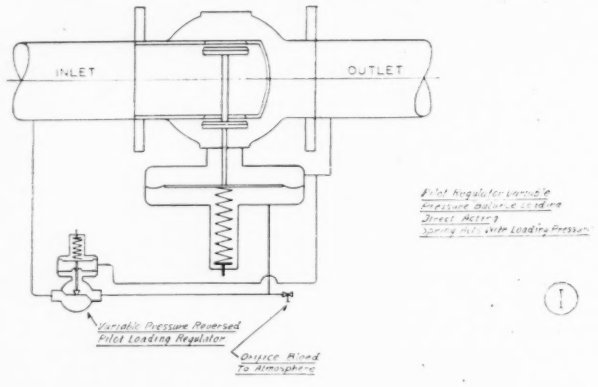

INLET
OUTLET
Pilot Regulator Variable Pressure Balance Loading Direct Acting Spring acts with Loading Pressure
Variable Pressure Reversed Pilot Loading Regulator
Orifice Bleed To Atmosphere
I

Fig. I. Pilot regulator, variable pressure, balance loading, direct acting, spring acts with loading pressure.

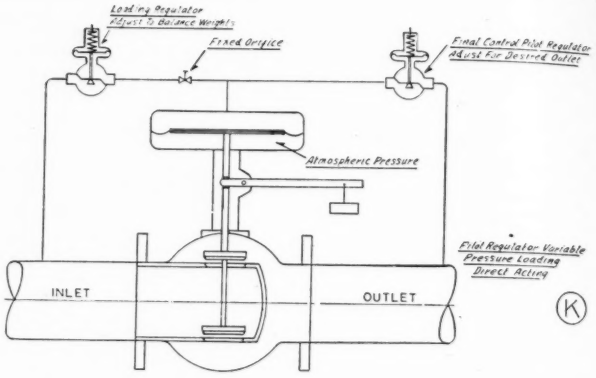


Fig. K. Pilot regulator, variable pressure loading, direct acting.

trolled outlet pressure, exists under the main diaphragm. Hence, this type is called "Pilot Regulator, Variable Pressure Loading, Direct Acting."

In "L" we have the same system as "K" except that the valves in the final control pilot regulator are reversed, so that the increase in controlled outlet pressure opens it, and the main valves in the regulator are also reversed so that an increase in loading pressure opens them. This system we call "Pilot Regulator, Variable Pressure Loading, Reverse Acting." These two systems, as we have noted, have a loading pressure which is not balanced by the outlet pressure. Systems "D," "E," "F," "G," "H," and "I" have a loading pressure balanced almost entirely by the controlled outlet pressure, hence the words, "balance loading" instead of the plain word "loading."

In the interest of added safety features, a combination such as *Figs. M* and *N* has been worked out. Here the top part of the regulator is the conventional lever and weight system. At the bottom of the regulator, there is attached a large sensitive diaphragm, the lower part of which is pressure loaded. Since in this arrangement the controlled outlet pressure is on the opposite side of the lower diaphragm from the loading pressure, we call it "pressure balance loading."

In the operating of this type enough weight is used on the lever to balance approximately 75% of the controlled outlet pressure on the top of the top diaphragm. The remaining 25% is obtained by the difference in pressure across the lower diaphragm; that is, the difference between the loading pressure and the outlet pressure. This difference in pressure is in reality caused by the drop in pressure across the fixed orifice. Here again, since we have a large sensitive diaphragm responding to the controlled outlet pressure, we have a large positive force positioning the main valve to control the outlet pressure accurately. It will be noted that the stem of the lower diaphragm butts against, but is not integral with, the main valve stem. This type of loading we call "Combination Lever and Weight and Pilot Regulator, Constant Pressure, Balance Loading, Reverse Acting."

In "N" the only variation is that the pilot loaded regulator is a variable pressure type instead of a constant pressure type. Hence, we call this system "Combination Lever, Weight and Pilot Regulator Variable Pressure, Balance Loading, Reverse Acting." With this variable pressure loading, we can compensate for the forces occasioned by the flow through the valves and by the variation in effective area of the two diaphragms.

The main advantage of design "M" and "N" is that, should the large sensitive diaphragm at the lower part of the regulator fail or leak excessively, or the pilot loading regulator plug close, the lower diaphragm drops and loses contact with the valve stem, and the weight and lever system takes over control at a lower pressure.

So far in our discussions we have talked about pilot controlling regulators which consist of one or two diaphragms controlling a small valve. In this system, the flow is small and it is not necessary to have much valve movement, so we can depend upon the regulator to turn out a very constant pressure—or, in the case of the variable pressure loading, a variable pressure which accurately responds to the control pressure.

Instrument Control

In instruments for measuring pressures, the responsive element is usually a bourdon tube, a helical pressure tube, or in some cases a diaphragm type of metallic pressure element. These ele-

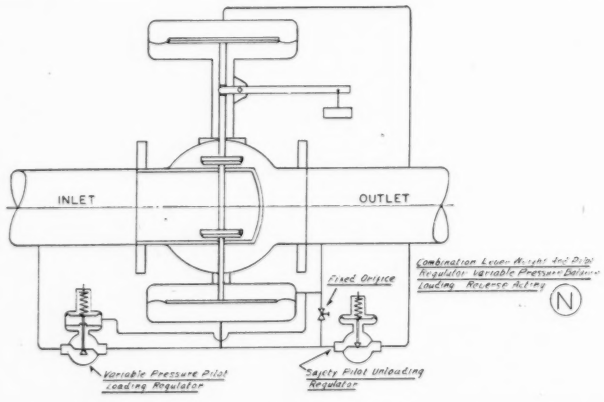


Fig. N. Combination lever and weight and pilot regulator, variable pressure, balance loading, reverse acting.

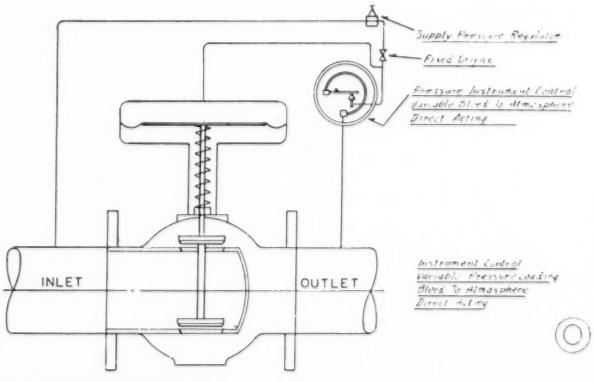


Fig. O. Instrument control, variable pressure loading, bleed to atmosphere, direct acting.

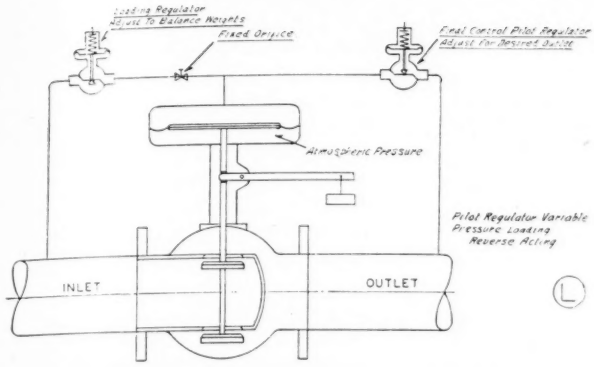


Fig. L. Pilot regulator, variable pressure loading, reverse acting.

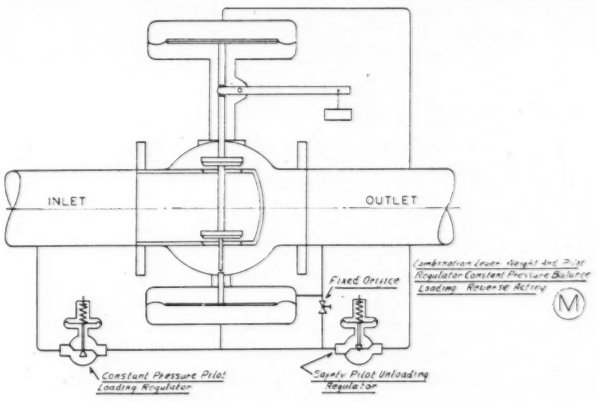


Fig. M. Combination lever and weight and pilot regulator, constant pressure, balance loading, reverse acting.

ments are in general very accurate and can be manufactured and calibrated to give accurate displacements for minor changes in pressure. However, the actual movement is small. These instrument elements can be applied to controlling pressures and when this is done, the type of control that results is called instrument control.

A very common type of instrument control is illustrated in *Fig. O.* Here an ordinary bourdon tube is so connected that the controlled pressure or outlet pressure is on the inside of the tube. The tube is so made that as the pressure changes, a flapper valve is operated about a fulcrum point in such a way as to back up or let out the bleed gas from a nozzle. This bleed gas is controlled to a very accurate value by a small pressure regulator. Ahead of the bleed in this type of control there is a fixed orifice. Downstream from the fixed orifice but upstream from the orifice controlled by the flapper valve is a lead taken to a large diaphragm case. Thus, a loading pressure is imposed on one side of the diaphragm.

On the opposite side of the diaphragm there is usually a spring pressure from a calibrated spring so arranged that it opposes the loading pressure. In this operation, should the outlet pressure increase, the bourdon tube will deflect outwardly in such a way as to move the flapper valve and hold back somewhat the flow of the bleed nozzle. This tends to back the pressure up all through the system and on back to the lead to the top of the diaphragm. This increased pressure from the top of the diaphragm will act against the spring, and tend to close the valves in such a way as to cut down the main valve opening and reduce the outlet pressure.

Conversely, if the outlet pressure falls off, the flapper valve moves so as to expose a larger variable orifice and will allow the gas to escape somewhat faster than it can flow through the fixed orifice. In this way pressure on top of the loading diaphragm is decreased and a spring will move the valves upward in such a way as to open the valves and restore the pressure which had started to decrease.

Thus, in this system we have a varying bleed and a varying loading pressure against the spring, so positioning the main valves as to maintain a constant outlet pressure. In the system "O," since the loading pressure tends to close the main valve, we call this a direct acting system. The design is then called "Instrument Control, Variable Pressure Loading, Bleed to Atmosphere, Direct Acting."

Another variation of this system is one in which the valves are so constructed that an increase in loading pressure on top of the diaphragm opens them instead of closing them, as in "O." When this is done, the bleed nozzle is reversed so that should the outlet pressure tend to increase, the flapper valve moves away from the nozzle and thus, because of the larger effective orifice, reduces the loading pressure; in this way, it permits the spring to move the valves toward the closed position and prevent the increase in pressure. In both of these systems the gas is bled to atmosphere through the variable bleed. The amount of gas so discharged to atmosphere varies, but usually averages from 30 to 50 cfh.

The system in *Fig. P* we call "Instrument Control, Variable Pressure Loading, Atmospheric Bleed, Reverse Acting."

There is objection in some installations to the bleed to atmosphere of the gas. In addition to being an economic

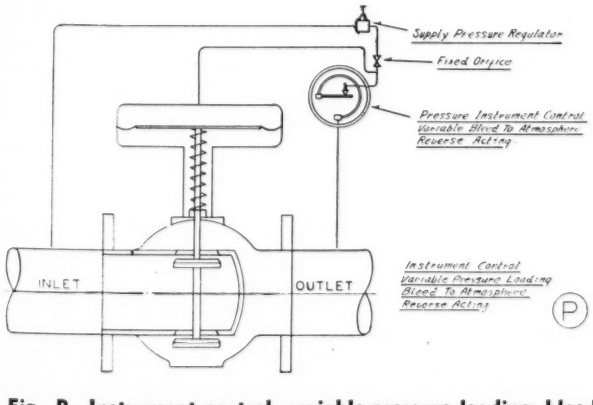


Fig. P. Instrument control, variable pressure loading, bleed to atmosphere, reverse acting.

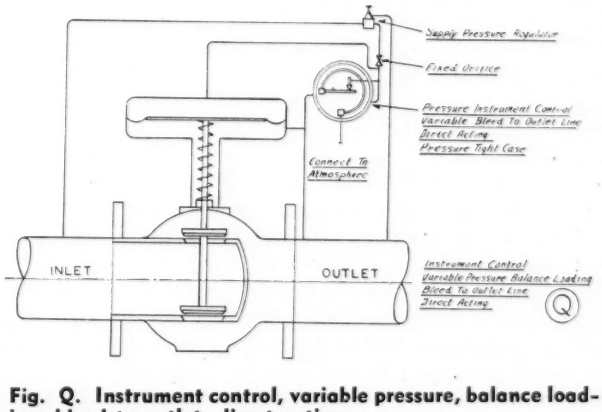

Supply Pressure Regulator
Fixed Orifice
Pressure Instrument Control Variable Bleed To Outlet Line Direct Acting Pressure Tight Case
Connect To Atmosphere
INLET
OUTLET
Instrument Control Variable Pressure Balance Loading Bleed To Outlet Line Direct Acting
Q

Fig. Q. Instrument control, variable pressure, balance loading, bleed to outlet, direct acting.

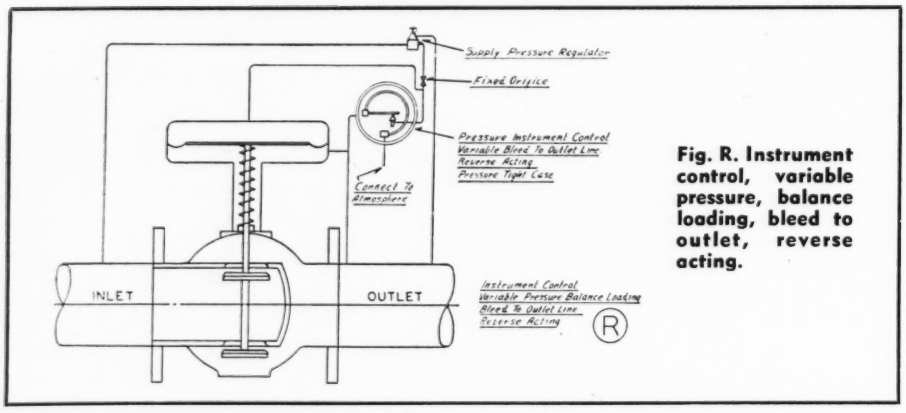


Fig. R. Instrument control, variable pressure, balance loading, bleed to outlet, reverse acting.

waste, it sometimes presents a fire hazard. To avoid such a bleed to atmosphere, the methods shown in *Figs. Q* and *R* may be employed. A pressure tight instrument case is required and the outlet or controlled pressure is piped (by large piping) into this case. The bourdon tube is so mounted that the inside of the tube is connected to atmospheric pressure. Hence, the usual bourdon tube procedure is reversed; however, it acts satisfactorily in this reverse manner, and tends to contract on increase of pressure within the case, or expand on decrease in pressure.

The so-called bleed gas is still controlled by a small pressure regulator which has a spring setting of about 15 psig. However, the outlet pressure of the system is connected to the top diaphragm casing of the small regulator, acting in the same direction as the spring so that the supply pressure to the instrument is always 15 psig *greater* than the outlet pressure.

In the arrangement illustrated in "Q," the flapper and nozzle are so arranged that with increasing pressure in the instrument case (the controlled outlet pressure), the bourdon tube tends to contract, thereby tending to close the variable orifice. This holds back the pressure after coming through the fixed orifice, and builds up an increased pressure on the top of the diaphragm. This in turn tends to close the main valves and prevent an increase in outlet pressure (which is the case pressure), allows the tube to expand, opens the variable orifice to a wider position, and allows the pressure on top of the diaphragm to decrease and the main valves to open and restore the pressure which had started to decrease.

It will be noted that at all times the pressure of the supply gas ahead of the fixed orifice is maintained at 15 psig above the outlet pressure and the pressure above the valve actuating diaphragm is from 3 to 15 psig higher than the outlet pressure, depending upon the flapper valve position. It will also be noted that the outlet pressure is connected to the underside of the main diaphragm so that the pressure difference which bears against the spring is from 3 to 15 psig. Since the inside of the instrument case is connected to the outlet side of the regulator, the supply gas passes off to the outlet side and is not wasted to the atmosphere as in the case of "O" and "P." Thus the objectionable waste of gas and the fire hazard of escaping gas are eliminated. This type of control we call "Instrument Control, Variable Pressure Balance Loading, Bleed to Outlet, Direct Acting."

In "R" we have merely turned the main valves so that they open on increase of loading pressure, and we have also reversed the nozzle arrangement in the instrument so that an increasing outlet pressure moves the flapper away from the nozzle and allows a lower loading pressure. This in turn allows the valves to close and thereby prevents a further increase in pressure.

The system illustrated in "R" is called "Instrument Control, Variable Pressure Balance Loading, Bleed to Outlet, Reverse Acting." Failure of the supply pressure will allow forces to equalize across the main diaphragm and the spring will then close the main valves, shutting off the gas supply. In "Q," failure of the gas supply to the instrument permits the valves to go to the wide open position.

The above discussion covers most of the types used in ordinary outlet pressure control work for the larger volumes. Small volume control such as is used in service regulator work and appliance regulators use simple spring or weight loading.

Comparison of Types

The selection of the type of control from those mentioned above will depend on many features, the principal ones being the six listed at the beginning of this article. Some of these factors break down into several detailed features as listed in *Fig. 1.* In each of the features to be considered we have two or more variations. *Fig. 1* compares these variations with the type of design.

Thus for "accuracy" we have listed four groups; for gas bleed we have listed "bleed to outlet line" and "bleed to atmosphere," etc.

At the left of the chart the various features and possible effects are listed. By projecting horizontally from left to right to the space corresponding to the type of control, it is possible to determine the particular characteristics of that type; or conversely, by projecting down from the various types of control, as identified by their letters corresponding to their drawings, the characteristics of this particular type may be determined.

In using this chart let us suppose that the design being considered is "D," which is described as "Pilot Regulator, Constant Pressure, Balance Loading, Reverse Acting, Spring Opposes Loading Pressure." By referring to the chart we see the following characteristics apply to this design.

Accuracy—plus or minus 1%.
Pilot bleed—to outlet line.
Failure of inlet pressure — regulator falls wide open.
Main diaphragm ruptures—regulator closes.
Pilot regulator valve closes off — regulator closes.
Pilot regulator valve fails to close — regulator takes control at increased outlet pressure.
Pilot regulator diaphragm ruptures — regulator takes control at increased outlet pressure.
Pilot bleed orifice closes — regulator continues in almost normal operation.

In some distribution systems, there might not be a serious consequence if the regulator shut off temporarily on main diaphragm failure or pilot regulator failure. In this case, "D" with its quite high control accuracy and its bleed to the outlet line would be a good system to use. In other places, such a complete shutoff would be undesirable, so some other system such as "E" would be applied — whereon failure such as above, the regulator opens wide — or "M" or "N," where regulator takes over control at a lower pressure point.

In any given regulator application, the 10 factors at the left in *Fig. 1* should be considered and the type of control chosen which in the opinion of the designing engineer meets, first, the most important desired features, and second, the greatest number of desired features. In almost every instance there will have to be certain compromises made between the control methods shown.

We have confined ourselves in general to accuracy and safety features which are in reality of prime importance in most work. We must not, however, forget to give some weight to other factors, such as service and maintenance conditions, adaptability, ruggedness, space requirements, accessibility, and capacity. Careful study of the above listed features and proper weighting of the various factors involved should provide the best design for any given installation.

GUIDE TO REGULATOR SELECTION

OPERATING CHARACTERISTICS VS. TYPE OF CONTROL

FIGURE LETTER →	A	B	C	D	E	F	G	H	I	K	L	M	N	O	P	Q	R
I. ACCURACY OF CONTROL																	
± 1/2%																	
± 1%																	
± 5%				X	X	X	X	X	X	X	X	X	X				
± 10%	X	X	X														
II. PILOT BLEED																	
TO OUTLET LINE				X		X		X		X	X	X				X	X
TO ATMOSPHERE					X		X		X				X	X	X		
III. INLET PRESSURE FAILURE																	
REGULATOR FALLS WIDE OPEN	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
REGULATOR CLOSES																	
IV. MAIN DIAPHRAGM RUPTURES																	
REGULATOR FALLS WIDE OPEN	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
REGULATOR CLOSES																	
REG. TAKES CONTROL AT LOWER OUTLET PRESSURE																	
V. PILOT CONTROL VALVE PLUGS																	
REGULATOR FALLS WIDE OPEN				X		X	X	X	X	X	X	X	X				
REGULATOR CLOSES					X									X	X	X	X
REG. TAKES CONTROL AT LOWER OUTLET PRESSURE				X		X	X	X	X	X	X	X	X				
VI. PILOT CONT. VALVE UNABLE TO CLOSE																	
REGULATOR FALLS WIDE OPEN					X									X	X	X	X
REGULATOR CLOSES																	
REG. TAKES CONTROL AT INCREASED OUTLET PRESSURE				X		X	X	X	X	X	X	X	X				
VII. PILOT CONT. DIAPHRAGM RUPTURES																	
REGULATOR FALLS WIDE OPEN					X									X	X	X	X
REGULATOR TAKES CONTROL AT INCREASED OUTLET PRESSURE				X		X	X	X	X	X	X	X	X				
VIII. PILOT BLEED ORIFICE PLUGS																	
REGULATOR FALLS WIDE OPEN					X									X	X	X	X
REGULATOR CLOSES																	
REG. CONTINUES ALMOST NORMAL OPERATION				X		X	X	X	X	X	X	X	X				
IX. INSTRUMENT SUPPLY PRESSURE FAILS																	
REGULATOR FALLS WIDE OPEN					X									X	X	X	X
REGULATOR CLOSES				X		X	X	X	X	X	X	X	X				
X. INSTRUMENT BLEED ORIFICE PLUGS																	
REGULATOR FALLS WIDE OPEN	X				X									X	X	X	X
REGULATOR CLOSES		X	X	X		X	X	X	X	X	X	X	X				

DEAD WEIGHT LOADING	
SPRING LOADING	
LEVER AND WEIGHT LOADING	
PILOT REG. -CONST. PRESS. -BAL.LOADING -REV. ACTING - SPRING OPP.	
PILOT REG. -CONST. PRESS. -BAL. LOADING -REV. ACTING - SPRING WITH	
PILOT REG. -VAR. PRESS. -BAL. LOADING -REV. ACTING - SPRING OPP.	
PILOT REG. - VAR. PRESS. - BAL. LOADING - REV. ACTING - SPRING WITH	
PILOT REG. - VAR. PRESS. - BAL. LOADING - DIR. ACTING - SPRING OPP.	
PILOT REG. - VAR. PRESS. - BAL. LOADING - DIR. ACTING - SPRING WITH	
PILOT REG. - VAR. PRESSURE LOADING - DIR. ACTING.	
PILOT REG. - VAR. PRESS. LOADING - REV. ACTING	
COMB. LEV. WT. PILOT REG. - CONST. PRESS. BAL. LOADING - REV. ACTING	
COMB. LEV. WT. PILOT REG. - VAR. PRESS. BAL. LOADING - REV. ACTING	
INST. CON. VAR. PRESS. LOADING - ATMOS. BLEED - DIR. ACTING	
INST. CON. - VAR. PRESS. LOADING - ATMS. BLEED. - REV. ACTING	
INST. CON. - VAR. PRESS. BAL LOADING - OUTLET LINE BLEED - DIR. ACTING	
INST. CON. - VAR. PRESSURE BAL. LOADING - OUTLET LINE BLEED - REV. ACTING	

Portland Exp

Anticipating natural gas, the Oregon utility is testing methods of producing interchangeable high-Btu oil gas

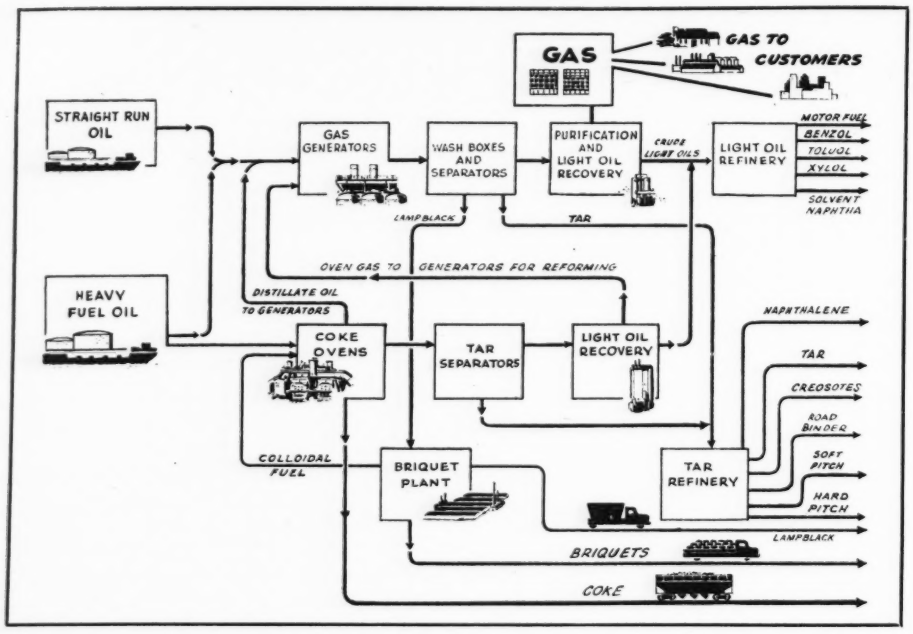


Fig. 1. Portland Gas & Coke Co. block flow diagram of products manufacture (1951).

By JAMES F. BELL

Portland (Ore.) Gas & Coke Co.

One of the fastest growing areas in North America, the Pacific Northwest, is looking forward to continued growth and prosperity and is counting on the eventual arrival of natural gas to help the region make use of its varied raw materials, strategically located harbors, and other undeveloped potentials.

Unofficial population increases since 1940 have been estimated at 38.8% in Oregon, 36.1% in Washington and, for 1941-49, 41% in the province of British Columbia. This growth was accompanied by tremendous industrial expansion, and the principal fuel used in the area is oil, since no anthracite and little bituminous coal are produced.

Since 1860 the gas industry has been serving the Pacific Northwest and, despite competition with very low-cost electricity and relatively cheap fuel oil, has grown to become a vital part of the area's economy. Presently, 25 companies serve 235,500 customers. During 1950, these firms manufactured and distributed more than 107 million therms of gas.

Portland Gas & Coke Co., one of three companies which serve 90% of the region's gas, is a pioneer in the production of high-Btu oil gas. The company's experiments and conclusions about the production of this type of gas are related here.

THE manufactured gas industry in the Pacific Northwest area is actively supporting the importation of natural gas. At the moment we are most concerned with seeing that provisions are made to assure the continuity of our industrial operations, particularly the plants that produce the materials essential to national defense. When this emergency is over, and the area is again able to offer power to all industries interested in coming here, natural gas would fill the present gap in the supply of low-cost thermal units.

The fact that the industrial fuel economy of the Pacific coast has been based primarily upon oil for many years led to the development and extensive use, up and down the coast, of manufactured gas produced by cracking oil. As a matter of fact, "Pacific coast oil gas" was, and is still, a very common expression in any discussion of the manufactured gas industry. Since the advent of natural gas in California during the early 20's, the oil gas manufacturing facilities of the large California companies have taken a relatively minor position in the operations of those companies.

Oil Gas Principal Fuel

However, at Portland, Seattle, and Honolulu, the principal gas produced is still oil gas. During the last few years, great interest has been shown among the eastern gas companies regarding the production of high-Btu oil gas in converted water gas machines by the so-called Hall process. The rapid introduction of natural gas to additional areas in the east has stimulated this interest because it is possible to produce a 1000-Btu oil gas which can, with proper appliance adjustment, be almost 100% interchangeable with natural gas.

Portland Gas & Coke Co. has followed these developments with great interest, and during 1951 has again entered into large-scale experimental operations on high-Btu oil gas. A review of the results of this program should be of interest for they undoubtedly will have a direct bearing at some time in the future upon the operations of the gas industry, particularly on the Pacific coast where oil still remains as the basic source of fuel.

Principles of Operation

As a basis for my discussion of high-Btu oil gas, I shall try to outline briefly the present operations of Portland Gas & Coke Co. so that everyone will have a general understanding of the general principles of an oil gas operation. With certain relatively minor modifications in process and equipment design, these remarks will also apply generally to the operations at Seattle and Honolulu and also to the oil gas installations of Pacific Gas & Electric Co. (San Francisco), and San Diego Consolidated Gas & Electric Co.

Portland Gas & Coke Co. has been manufacturing gas by thermally cracking fuel oil in checkerbrick-type generators since 1906, and during the intervening years has processed approximately 60 million bbls of fuel oil into gas and other residual products. In order to maintain reasonable rates for its utility service in the face of competition with low cost fuel from oil and wood waste, the company has, for many

Experiments With High-Btu Oil Gas

years, energetically pursued an oil gas residual processing and marketing program until, at the present time, the gross revenue from these chemicals accounts for approximately 35% of the total operating revenue. These by-product or residual revenues have enabled our company, by and large, to vary rates only with the cost of fuel; to absorb, without passing on to the public, the greater part of all wage increases and increases in material and operating costs other than fuel; and to establish a substantial pension plan and other employee benefits.

When heavy fuel oil is cracked to produce gas, the residuals consist primarily of aromatic light oils, such as benzol, toluol, xylol and solvent naphtha, aromatic tars which can be distilled to produce naphthalene, wood preservatives, roadbinder materials, pipe coatings and electrode binder pitches, and high purity carbon.

Residual Products Important

Whether an oil gas operation is producing either low- or high-Btu gas, the yield of residual products is equal to approximately 50% by weight of the oil charged to the generators. Therefore, the economics of an oil gas operation are closely related to the residual product markets which are available both as to price and quantity.

At the present time, Portland is supplying an oil gas having a heating value of 570 Btu per cubic foot.

Market Values Fluctuate

Fig. 1 is a flow diagram of the present Portland operation which will indicate to you some of the residual processing and marketing activities which must accompany any successful and low cost oil gas operation.

Fig. 2 shows a sectional view of a Portland 20-ft twin generator set. These sets are not basically different, except in size and the arrangement of some heating chambers, from all other oil gas generators.

During the course of time, the market values of light distillate oils, such as diesel, became very high compared to the heavier industrial fuel oils. These changing relationships in the dollar value of oil products have required the oil gas producers to maintain an attitude of constant vigilance and willingness to change their operations to accommodate the lowest price liquid fuels available on the Pacific coast. As a result of this reasoning, these companies have been able to devise operating techniques which enabled them to produce oil gas from heavy bunker fuel oils having an API gravity as low as 8° and a Conradson carbon content up to 20%. These oils are much heavier than anything being used on the eastern seaboard, and you must remember, when reading the literature or discussing oil gas, that when an eastern operator conscientiously speaks about heavy oil, he is referring to a product which we normally call medium fuel oil on the Pacific coast.

As one of the largest remaining oil gas producers in the world, our company has had a vital interest in high-Btu oil gas and, as a matter of fact, that interest goes back over a period of many years. In 1923, the first patents on the production of high-Btu oil gas were issued to the late E. L. Hall, chief engineer of our company. At the present time, we are interested in lowering the net holder cost of gas by reducing the quantity of oil per therm, and increasing by-products revenues. We are interested in this change as a possible means of increasing the capacity of our heavily loaded distribution system. We are interested in a process which would enable our manufacturing plant to operate for standby and peak shaving after the introduction of natural gas into our area. We are also interested in a process which would enable the plant to operate profitably along with natural gas, due to relatively low costs and high by-product revenues.

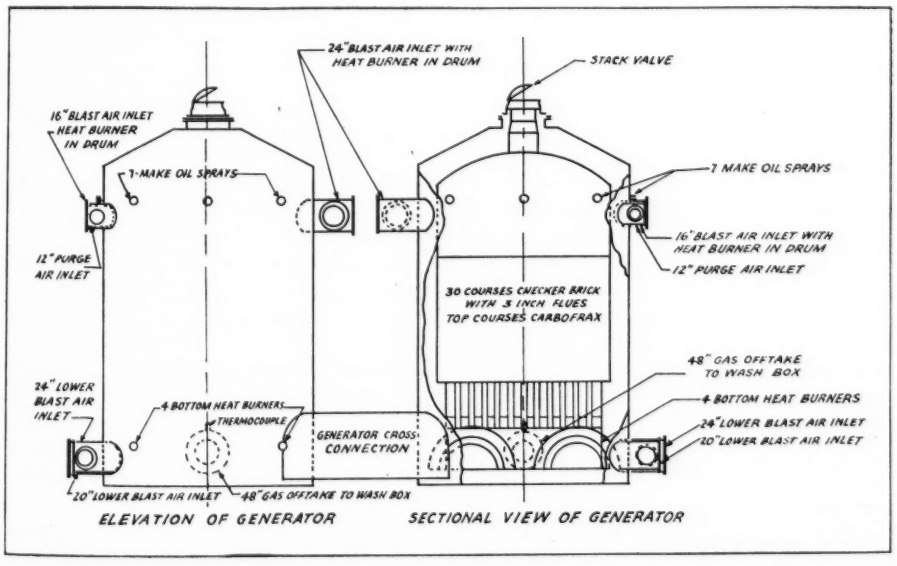

24" BLAST AIR INLET WITH HEAT BURNER IN DRUM
STACK VALVE
16" BLAST AIR INLET HEAT BURNER IN DRUM
7 MAKE OIL SPRAYS
7 MAKE OIL SPRAYS
16" BLAST AIR INLET WITH HEAT BURNER IN DRUM
12" PURGE AIR INLET
12" PURGE AIR INLET
30 COURSES CHECKER BRICK WITH 3 INCH FLUES TOP COURSES CARBOFRAX
48" GAS OFFTAKE TO WASH BOX
24" LOWER BLAST AIR INLET
4 BOTTOM HEAT BURNERS
THERMOCOUPLE
GENERATOR CROSS CONNECTION
4 BOTTOM HEAT BURNERS
24" LOWER BLAST AIR INLET
20" LOWER BLAST AIR INLET
20" LOWER BLAST AIR INLET
48" GAS OFFTAKE TO WASH BOX
ELEVATION OF GENERATOR
SECTIONAL VIEW OF GENERATOR

Fig. 2. Diagrammatic view of typical pair of 20-ft generators and appurtenances.

Hall Process Shortcomings

We followed with interest the recent work on the Hall high-Btu process. This process is an outgrowth of studies of methods to convert water gas sets to high-Btu oil gas producers. As such, it is of great value to the manufactured gas industry because of the relatively large production of water gas in this country. With particular reference to the Pacific coast, however, these studies did not explore all of the avenues which might be open to companies which did not have water gas sets to convert, and which cannot obtain, at reasonable prices, charging stocks similar to those

TABLE 1. SUMMARY OIL GAS FOTS COSTS

	Portland Generator Operation				Portland Coke Oven	Generator Operation Cambridge	
	Actual	Proposed			Actual	Actual 2-Shell	Actual Twin
Gas—Btu/cu ft	570	1000	1000	1000	1030	970	969
Oil API	Lean 8.7	Lean 8.7	Lean 15	Lean 30	Lean 8.7	Partially Stripped Heavy	Light
PRODUCTION DATA							
Make oil, gal./Mcf	9.77	17.70	16.40	13.40	18.2	10.525	9.63
Heat oil, gal./Mcf	0.40	0.40	0.60	1.00	3.8	0.845	1.45
Tar, gal./Mcf	0.57	6.20	5.74	2.25	6.2	2.63	1.93
Light oil, gal./Mcf	0.47	1.24	1.33	1.84	1.40	0.35	0.35
Carbon, lb/Mcf	27.00	—	—	—	24.00	—	—
Steam used, lb/Mcf	40	72	67	57	150	23.6	10.3
PRICES							
Make oil, ¢/gal	4.76	4.76	5.72	9.08	4.76	5.8	8.5
Heat oil, ¢/gal	4.76	4.76	4.76	4.76	4.76	5.8	8.5
Steam, ¢/M lbs	60	60	60	60	60	70	70
COSTS							
Make oil, ¢/Mcf	46.5	84.2	93.8	121.7	86.6	66.12	94.18
Heat oil, ¢/Mcf	1.9	1.9	2.9	4.8	18.3	—	—
Steam, ¢/Mcf	2.0	4.3	4.0	3.4	9.0	1.65	.72
Total	50.4	90.4	100.7	129.9	113.9	67.77	94.90
BY-PRODUCT CREDITS							
Light oil							
40% at 26¢	—	13.0	13.8	19.3	14.6	—	—
60% at 16¢	—	11.8	12.8	17.6	13.4	—	—
100% at 26¢	12.2	—	—	—	—	—	—
100% at 12.25¢	—	—	—	—	—	4.288	4.288
Tar							
at 4.76¢/gal.	—	29.5	—	—	—	—	—
at 6.00¢/gal.	—	—	34.4	—	—	—	—
at 9.00¢/gal.	4.5	—	—	20.2	55.8	—	—
at 4.00¢/gal.	—	—	—	—	—	10.520	—
at 4.50¢/gal.	—	—	—	—	—	—	8.685
Coke at $21.50/ton	—	—	—	—	25.2	—	—
Lampblack at $9/ton	12.1	—	—	—	—	—	—
Steam credit	—	—	—	—	—	3.500	3.780
Total credits	28.8	54.3	61.0	57.1	109.0	18.308	16.753
Net FOTS costs	21.6	35.1	39.7	72.8	4.9	48.46	78.15
Net on 570-Btu base	21.6	20.0	22.6	41.5	2.7	26.9	43.40

available on the eastern seaboard, and whose problems in general were beyond the scope of the work done on the Hall process.

With particular reference to the Pacific Northwest, the Hall process studies have not included in any detail consideration of residual yields for processing into quality by-products with respect to various market potentialities. Therefore, Portland embarked in 1951 upon a high-Btu oil gas experimental program designed around our own particular problems, but which we desired to correlate with the work which has been done on the Hall process for the mutual benefit of all members of the manufactured gas industry.

In this connection, a detailed technical report of our present operations and our contemplated experimental program was presented to the gas production research committee of AGA in February and a supplemental report upon the first high-Btu test results was presented to that same group in May. From a study of our own, and other low-Btu oil gas operations, the results of light oil high-Btu oil gas operations on the Pacific coast sets, not only at Portland but also at San Diego, Los Angeles, and San Francisco, and the recent work in the east on the Hall process, convinced us that we could in all probability make high-Btu oil gas out of the very heavy Pacific coast residual fuel oils in oil gas generators of the type installed at Portland.

Table 1 indicates the comparison of our present operations with the estimates of the proposed high-Btu operation, and the reported statistics from Cambridge, Mass. The cost data in this table are worked out on the FOTS (fuel, oil, tar and steam) basis which had been used in earlier publications on the eastern operations and is followed here for easy comparison. I wish particularly to call your attention to the large variation in cost depending upon the credit assigned to the tar.

On the proposed heavy oil operation at Portland, if a tar credit of 9 cents per gallon had been assumed comparable

to that in the Cambridge operation, the net FOTS cost would have been less than 9 cents per Mcf. On a high-Btu operation, the value of the residuals contained in the tar is, as you can see, of the utmost importance in arriving at costs.

Types of Generators

Table 2 shows a comparison of operating characteristics of various high-Btu generators. Both the Baltimore four shell, a converted water gas machine, and the Gas Machinery Co. twin generator, are machines based upon the Hall high-Btu process. I want to call your attention to the outstanding difference between the Portland machines and the eastern sets in that Portland has 36,000 checkerbrick for a production of 113 Mcf per hour, as against 17,000 and 24,000 checkerbrick for a production of 155 and 140 Mcf per hour in the other sets, respectively.

There has been a great deal of speculation about this matter of generator size and checkerbrick content as related to gas-making capacity, but at the present time, to the best of my knowledge, the relative merits of the two types of machines remain controversial.

The first series of high-Btu test runs in Portland in 1951 was conducted between April 22 and May 18 under carefully controlled conditions. Our plant was remarkably well equipped for a test of this kind, which is apparent from the flow diagram on *Fig. 3*. Having two relief holders and a separate light oil recovery system for the oil coke oven battery, we were able to run the high-Btu generator gas through this system for accurate measurement of gas production and by-product yields and in turn reform the high-Btu gas in another set of generators to 570 Btu, thereby not disturbing the composition of the street gas.

Careful Test Planning

Tests were scheduled so that two weeks of the run were conducted while the coke oven plant was shut down for semi-annual maintenance, thereby giving us measurements without any contamination from other operations in the plant. *Table 3* compares the actual results obtained in these test runs as related to the estimate prepared prior to the start of the project. Very little modification of the generators and auxiliary equipment was necessary to prepare for these runs, the primary work being piping to conduct the gas into the coke oven relief holder and to allow tar to be taken from the washbox in place of lampblack. A small amount of detergent was added to the wash box and tar scrubber water in a closed system which

TABLE 2. COMPARISON OF GENERATOR & OPERATING CHARACTERISTICS — HIGH BTU GENERATORS

	Baltimore 4-Shell	Gasmaco Twin Regeneration	Portland Gas 20-ft Twin
Source	AGA Bulletin HB-1	Gas Machinery Co. A-203 and Kyle	Proposed and 1939 operation
Generators ID	9′	9′-3″	16′-4″
Generators, height	18′-8″	No data	30′
Superheater, ID	9′	9′-3″	None
Superheater, height	24′-3″	No data	
Checkers per twin set:			
Generators, silicon carbide	2200	2880	3800
Generators, clay	500	1900	31200
Superheaters, clay	14400	19220	—
Total checkers	17100	24000	36000
Per cent silicon carbide	12.8	12.0	10.8
Cycle, minutes	4	4	12
Blow, seconds	103	120	360
Make, seconds	100	100	161
Type oil, % Conradson carbon	13.03	13	16
(API gravity)	(14.3)		(8.7)
Make oil, gal./cycle	117	107	400
Btu of gas make, lean	894 calc.	900 est.	1000
Make oil, gal/Mcf	11.3	11.4	17.7 est.
Air rate, cu ft/min	25600	24900	26000 max.
Air, cu ft/cycle	44000	49800	156000
Air, cu ft/gal make oil	375	465	390
Air, cu ft/lb Conradson carbon in make oil	360	450	280
Air, cu ft/min/1000 brick	1500	1050	720
Air, cu ft/min/sq ft checker area	403	370	366
Oil rate, gal/min	70	64	150
Oil rate, gal/min/1000 brick/ single generator and superheater	8.2	5.3	4.2
Oil rate, gal/min/sq ft	1.1	0.95	0.35
Mcf gas/set—hour	155	140	113
Mcf gas/min of oil input time	6.15	5.60	8.5
Mcf gas/min input time/ 1000 brick	0.70	0.46	0.24
Mcf gas/min input time/ sq ft set area	0.97	0.83	0.20
Steam during oil feed, lb/cycle	180	—	500
Steam for purge, lb/cycle	100		100
Total steam, lb/gal make oil	2.4		4.0

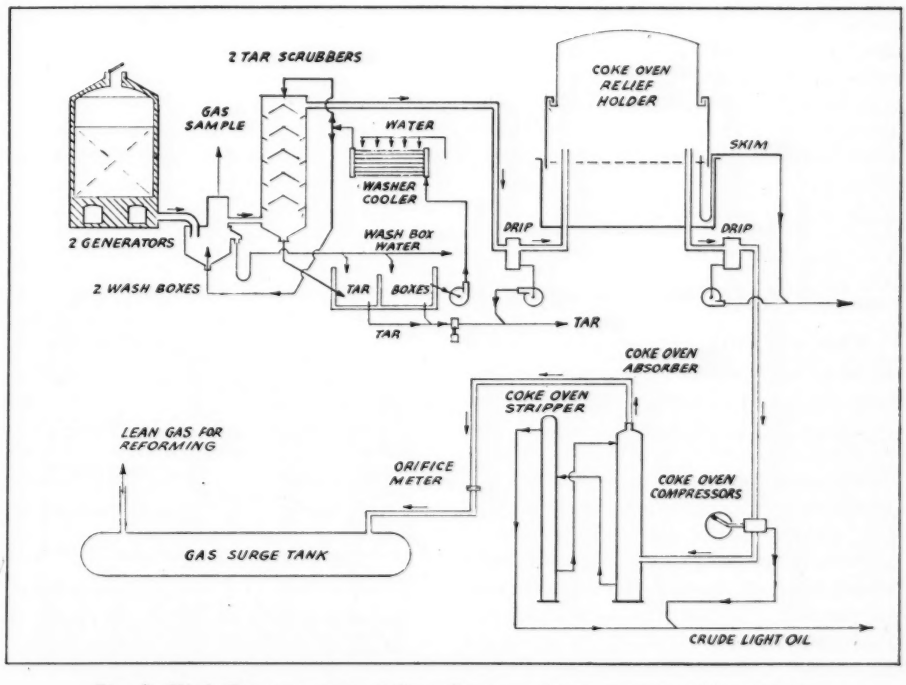


Fig. 3. High-Btu test general flow diagram, first run series, May 1951.

TABLE 3. COMPARISON OF RESULTS WITH ESTIMATES*

(1951 HIGH-BTU TESTS, FIRST RUN SERIES, MAY 1951)

	Estimated from Oil Gas Production Report	April 22 thru May 1 Actual Average	April 22 thru May 1 100-Btu Equivalent Calculated	May 7 thru May 13 Actual Average	May 7 thru May 13 1000-Btu Equivalent Calculated
Yields					
Mcf/day/set	2600	2523		1777	
Btu/cu ft	1000	860	1000	796	1000
Make oil, API	8.7	8.6		8.4	
Make oil, gal/M	17.70	15.07	17.52	16.54	20.77
Heat oil, gal/M	.40	.20	.24	0.0	0.0
Tar, gal/M	6.20	5.80	6.74	6.35	7.98
Light oil, gal/M	1.24	.59	1.07	.85	1.07
Steam, lb/M	72	44 (Steam Atomizing)	57	10 (Mechanical Atomizing)	19
Costs — c/Mcf					
Make oil @ 4.76c		84.2	83.4		98.9
Heat oil @ 4.76c		1.9	1.1		0.0
Steam @ 60c		4.3	3.4		1.4
		90.4	87.9		100.3
Tar credit @ 4.76c		29.5	32.1		38.0
Light oil credit					
40% @ 26c		13.0	11.1		11.1
60% @ 16c		11.8	10.3		10.3
		54.3	53.5		59.4
Net FOTS		35.1	34.4**		40.9

*Cost bases same as Oil Gas Production Report.

**This compares with an equivalent FOTS cost of 39.1c/Mcf on present 570-Btu operation as reported in the Oil Gas Production Report.

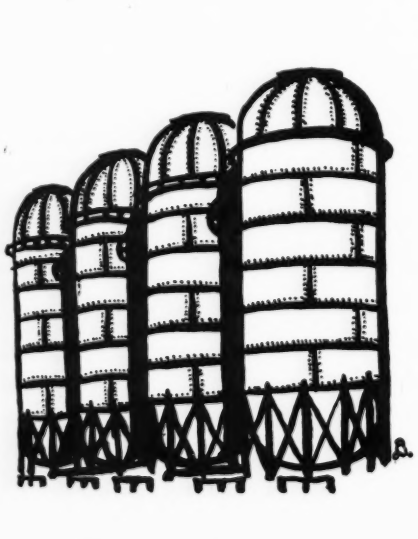
prevented the formation of heavy emulsions in the primary tar box, and during the whole run, no difficulty was encountered in handling the tar at any point in the system.

One phenomenon worthy of mention here was encountered during this run. In spite of operating at temperature levels which should have produced a lean gas of 1000 Btu or more per cubic foot, it was found that approximately a total of 30% CO and CO_2 was produced in the gas. These diluents prevented the attainment of a lean gas Btu much above 860. It was assumed in accordance with the Wills Willien theory and calculations, that these diluents were a result of a steam gas reaction between atomizing and purge steam with carbon deposited upon the checkers.

Hydrogen Loss A Problem

We were, however, somewhat puzzled by the fact that the steam gas production remained so high at the lower temperature levels needed for higher Btu production, and we finally installed mechanical atomizing sprays, but found, to our amazement, that the CO-CO_2 content of the gas did not change materially, even though practically no steam entered the set. It was also apparent that using the Wills Willien calculation, some of the oil gases produced in these runs contained insufficient hydrogen to satisfy the steam gas component, thus leaving impossible true oil gas composition with no free hydrogen.

Some explanation of this apparent anamoly became necessary. The loss of hydrogen from steam gas by the hydrogenation of oil gas has been recognized but never in the past 30 years of high-Btu experiments and 43 years of standard 570-Btu oil gas production by this company had such a deficiency of hydrogen been noted. Absorption or diffusion of air or combustion products into the porous checkbrick during the heating period with displacement during the making period also failed to explain the phenomenon on the grounds that such oxygen would have to carry its quota of nitrogen from the air. Finally it was decided that some form of chemical reaction such as oxidation during the heating period with subsequent reduction during the making period was indicated.



Oxidation Gas Theory

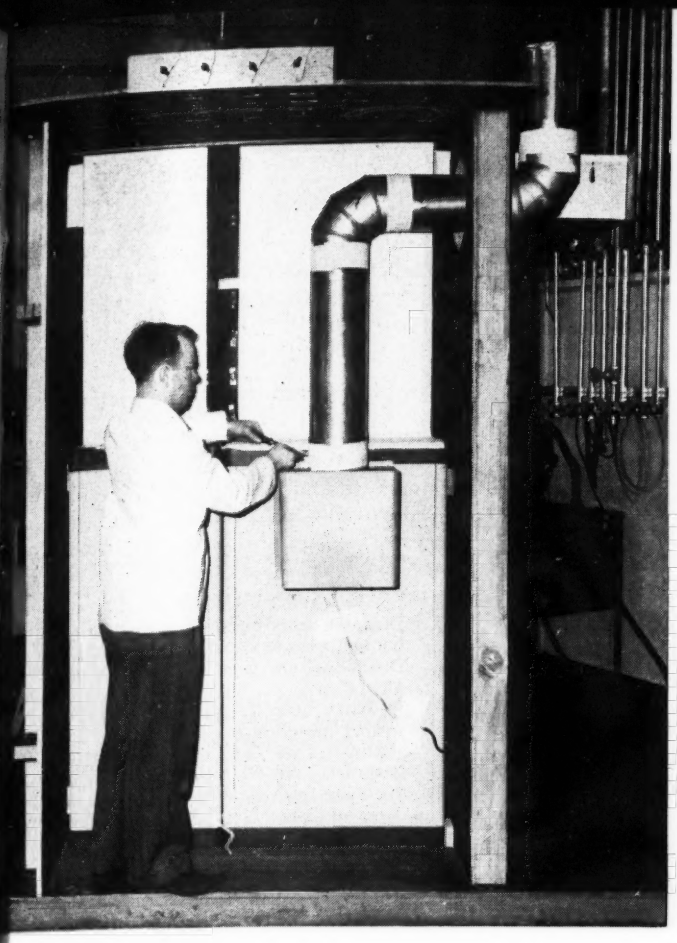
The California oils used for this experiment contain ash which is relatively high in nickel and vanadium as well as iron. The checkerbrick in these sets had been in service from 12 to 20 months and undoubtedly had a high accumulation of metal-bearing slag. It is proposed that slags on these checkers provided the medium by which oxygen from air was stored by chemical reaction (oxidation) during the heating cycle and released free of nitrogen (reduction) during the making cycle with the formation of excessive amounts of CO_2 and CO. For convenience, this gas has been termed "oxidation gas." The amount of oxidation gas produced indicated a consumption and subsequent release of oxygen at the rate of 2000 cu ft per cycle per generator shell.

During the summer, to confirm this theory, the two shells used in the high-Btu experiment were completely rebricked, and upon the resumption of high-Btu production on these shells during the latter part of July with entirely new checkerbrick, the CO—CO_2 percentage seems to have leveled off at about 5%. This further confirms the oxidation gas theory. I might add that this theory also explains our inability, over a period of many years, to get what we thought was good sample of stack gas from the combustion period due to the fact that these samples always contained a large excess of nitrogen. The ultimate implications of this phenomenon are not known at the present time, but it is certainly an important factor which should be taken into account by anyone operating or contemplating the operation of an oil gas plant.

Future Is Bright

We are certain from the results of this year's experimental work that high-Btu oil gas can be produced economically and without any great technical difficulties from the heaviest types of California residuum fuel oil on Pacific coast type oil gas sets. This offers opportunity for production of a 1000-Btu gas with a high factor of interchangeability with natural gas at what can be a small increase in cost per therm.

We feel that this procedure, along with the other avenues of advancement now on the horizon for the manufactured gas industry, offers remarkably attractive prospects for the future either alone or as a vital and necessary adjunct to a supply of natural gas delivered through long and costly pipelines.



Test enclosure simulates typical alcove or closet installation. Rear closet wall has been removed to show the furnace in place.

Approving Gas Furnaces For Closet Installation

By FRANK FIEDLER JR.
Pacific Coast AGA Laboratories
Los Angeles

APPROVAL of compact, space-saving gas heating plants for the modern home of today calls for special test procedures to establish their safe and satisfactory performance. Close clearances to combustible walls and ceilings are involved in their installation in confined spaces such as closets and alcoves. Such conditions introduce features not presented by the usual house-heating appliance installed in a conventional manner. Consequently approval standards have been expanded to cover central heating equipment intended for confined space installation and a separate classification established for units approved for such use.

Testing Is Optional

Full details for testing of these appliances are now covered in published addenda to "American Standard Approval Requirements for Central Heating Gas Appliances." They cover gas boilers, gravity furnaces, and forced air furnaces. Testing for approval for confined space installation is optional with manufacturers. Many desire such approval in addition to approval for conventional installation. To secure it, compliance with all specified features is necessary.

The basic safety provisions for confined space approval are essentially the same for the various types of central heating appliances. However, since the forced air furnace is equipped with a blower to provide forced circulation, additional tests must be applied to insure safety in the event of a blower failure. To best describe the test procedures followed, this discussion will be confined to forced air furnaces.

Basic Requirements

As a basic prerequisite for alcove or closet approval, the unit must first comply with current "American Standard Approval Requirements for Central Heating Gas Appliances." These cover conventional test methods and requirements. In addition, its limit control must shut off the gas supply to the main burner when outlet circulating air reaches a temperature of 200° F, a maximum lower than that usually specified. If a stop is necessary in order to limit the temperature to 200° F, its position must be fixed.

For test purposes the furnace is placed in an enclosure simulating alcove or closet installation. A typical closet mounting is illustrated, with the rear closet wall removed to show the furnace in place. The manufacturer has the option of selecting specified clearances between the enclosure walls and the nearest part of the furnace casing. Tests are conducted using the clearances as selected. Frequently zero clearance or direct contact with closet or alcove walls is desired.

Temperatures on the adjacent combustible surfaces of the enclosure are first determined under normal operating conditions. The limit control is bypassed and outlet air temperature established by restricting the circulating air flow until outlet air temperature reaches 130° F above the inlet air temperature. The appliance is then allowed to operate at its normal gas input rating until equilibrium temperatures have been reached. Under these conditions, temperatures measured on walls, ceiling, and floor are not permitted to be more than 90° F above that of the inlet air. This limitation does not apply to the floor temperature if the appliance is designated for installation on noncombustible floors.

Special Requirements

In addition to determining temperatures of the closet or alcove surfaces, those attained by electrical conductors, controls of various types, and electrical components are also measured. Electrical components must be suitable in all cases for the temperatures to which they are exposed. Allowable temperature limits for the various components

are tabulated in the requirements.

Blocked flue and down draft tests are applied to make certain that the draft hood is not adversely affected by its location in an alcove or closet. These are conducted after equilibrium temperatures have been attained in the enclosure. Combustion, as determined by the analysis of the flue gases, must be just as satisfactory under these severe test conditions as when the furnace is installed in a conventional manner and operated normally.

Adverse Conditions Simulated

A further series of tests is next conducted, designed to anticipate adverse conditions which sometimes occur in the field during the normal life of the appliance. The first test consists of simulating restriction of air circulation which may be caused by stoppage of air filters. The second is that of restriction of air circulation due to a defective motor, blower, or fan belt. The third test simulates restrictions caused by closing one or more warm air discharge registers.

For the conduct of these particular tests, the operation of the appliance in each case is regulated so that the circulating air temperature is just below that required for the limit control to shut off the gas supply to the main burner. In addition, the limit control and fan switch are adjusted to the maximum temperature setting and the minimum differential. After equilibrium temperatures are attained, separate tests are applied for each of the three conditions described. In each case temperature rise on the wall, floor, or ceiling is not permitted to exceed 175°F above the temperature of the inlet air. This applies for the first shutoff cycle as determined by the operation of the limit control. On the sixth and subsequent shutoff cycles, the maximum temperature observed must not exceed 90°F above the compartment inlet air temperature.

The following procedures are employed to obtain the three conditions to be reproduced:

1. Gradually restrict the furnace inlet air opening or the filter until the limit control functions.
2. Disconnect the circulating fan motor from the electrical circuit and allow the furnace to cycle on the limit control.
3. Close the warm air outlet and allow the furnace to cycle on the limit control.

During the above tests the temperatures attained by the electrical conductors, controls, and other electrical components are again observed. When the appliance is cycling on the limit control, the maximum temperatures reached by these components is measured. On the first cycle of operation they must not exceed 115% of the temperature rises as tabulated in the requirements. Upon the sixth and subsequent shutoff cycles the maximum temperatures must not exceed those specified.

Explicit Label Necessary

In addition to complying fully with the performance tests, the appliance must be plainly labeled to indicate the type of installation for which it is intended (alcove or closet). The minimum acceptable clearances from the furnace and its flue or vent connector to combustible construction and the type of flooring (combustible or non-combustible) on which the furnace may be installed must also be clearly indicated. The label must be a metal plate or of a reasonably permanent type such as a decalcomania. In addition to the above marking, the manufacturer must furnish installation instructions which will clearly indicate that the installation must comply with the regulations covering the servicing of the appliance.

Symbols Used in AGA Listing

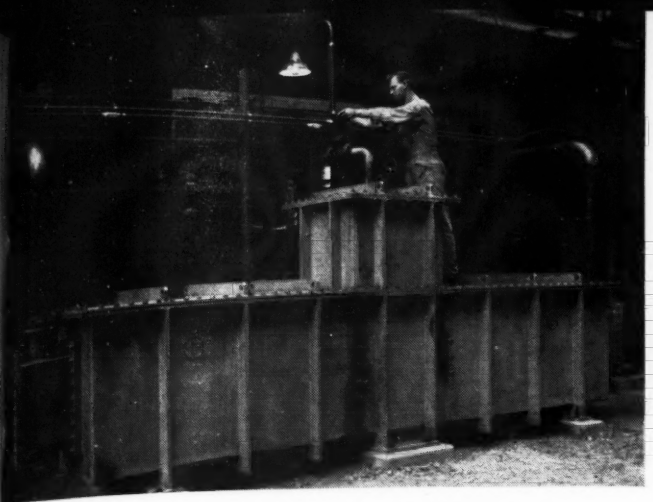
Upon satisfactory compliance with all applicable requirements, the appliance is approved and listed in the "Directory of Approved Gas Appliances and Listed Accessories," published by the American Gas Assn. Laboratories. The following symbol designations are used:

A — Distance from top of furnace (casing, bonnet, or plenum chamber);
B — Distance from front unit. Al indicates alcove.
C — Distance from flue or vent connection in any direction.
D — Distance from back of unit.
E^{L}—Distance from left side of unit.
E^{R}—Distance from right side of unit.
F — Type of floor: "NC" for non-combustible, "C" for combustible.

A large number of models fabricated by many manufacturers are now approved and listed for confined space installation. Others are constantly being added. Home owners wishing to install this type of heating equipment thus have a wide range of styles and sizes available for their selection. Readily identified by display of the registered Laboratories approval seal they may be depended upon to provide safe, dependable, and satisfactory service under the exacting conditions they may be required to meet. Their proven ability to give such service has been well demonstrated by their past performance.

TO PROMOTE faster, more efficient customer service, Milwaukee Gas Light Co. is using 15 specially equipped fitting trucks like the one shown above. Complete with fluid drive, directional signal lights, and three locked compartments on each side, the McCabe-Powers- built trucks are designed to keep materials accessible and in first-class condition.

STOCK INCLUDES about $300 worth of fittings. At end of each day fitters requisition material used, and truck is restocked by a special night-loading crew. Space is provided for lengths of pipe, a sectional 8-ft ladder, and meters of every size. With a full load of tools, fittings, and equipment, the cost of stocking each truck was about $700.



Rochester Installs Low-Cost, Multi-Purpose Gas Plant

Closeup view of Koppers-Hasche furnace which has a core of checker tile surrounded by high-duty refractory brick, insulating brick, and a steel shell.

A LOW-COST gas producing plant, so versatile that it can make city gas ranging in heat content from 300 to 1050 Btu, has gone into production at the East Plant of the Rochester (N. Y.) Gas & Electric Corp.

Described by the Koppers Co. as "revolutionary," the new plant, built as a demonstration unit, is designed to produce more than 1 MMcf per day, using gasoline, LP-Gas, light oil, or natural gas as raw material. Employing the Koppers-Hasche process, the plant was built by the engineering and construction division of Koppers Co. Inc., which has world patent rights for this type of installation under a grant of Dr. R. Leonard Hasche, its inventor.

First Low-Cost Unit

According to J. Hawley Taussig Jr., manager of the gas department of Koppers, the process, based on either thermal or catalytic cracking, gives the gas industry the first low-cost unit for either the reforming of natural gas or the production of peak load gas.

"With present high costs, it is frequently impractical for utilities to serve straight natural gas to customers because millions of dollars would be required to convert meters and appliances," says Mr. Taussig. With this process, Koppers engineers believe that natural gas may be reformed in such a manner that it may be delivered at the same heat content as the old gas but with a reduction in costs since more of the lower-Btu gas can be produced.

The gas is also interchangeable with natural for use in peak shaving.

Peak input of natural gas to the Rochester plant is approximately 300 Mcf per day, which yields slightly over 1 MMcf of 300-Btu gas. When enriched cold with natural gas, this gives 1.4 MMcf of 537-Btu gas, which is the base sendout in Rochester proper.

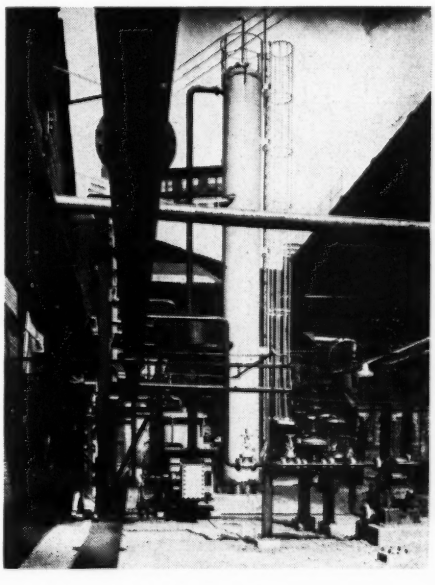
Koppers engineers say that it is practical to build units utilizing the equipment of a capacity up to 12 MMcf per day production. "Significant economies" can be made in construction of the larger units.

Heart of the Koppers-Hasche process is a thermal reforming furnace which may operate at varying degrees of temperature up to, and even above 2200° F. For producing city gas, it is operated in the 1500-1600° range.

In the Rochester installation as it is presently being used, natural gas comes in from a large main, pressure is reduced to 5 psi, and the gas is metered and carried through a valve which regulates its rate of flow. From here, it goes to a mixing chamber where it is combined with air in a normal proportion of 1 to 1. This mixture enters the furnace for treatment.

Inside the furnace is a core of checker tile 9 in. wide and 20 in. high, divided in the center by a reaction chamber in which a catalyst may or may not be used, depending on the type of gas to be produced. Surrounding this core is 4½ in. of high-duty refractory brick, a like thickness of insulating brick and a steel shell, ½ in. thick.

End view of the process unit showing metering and pressure equipment in right foreground, furnace in center with cooling tower behind it. Mixing chamber is along wall of building at left.



Action of the furnace is started with special gas burners under the checker tile. When input of gas is started (after the central region of the furnace is heated to about 2000° F), the action becomes self-supporting and starter burners are turned off. The gas and air mixture flows for one minute into one end of the 20-ft long furnace, then for one minute at the other end.

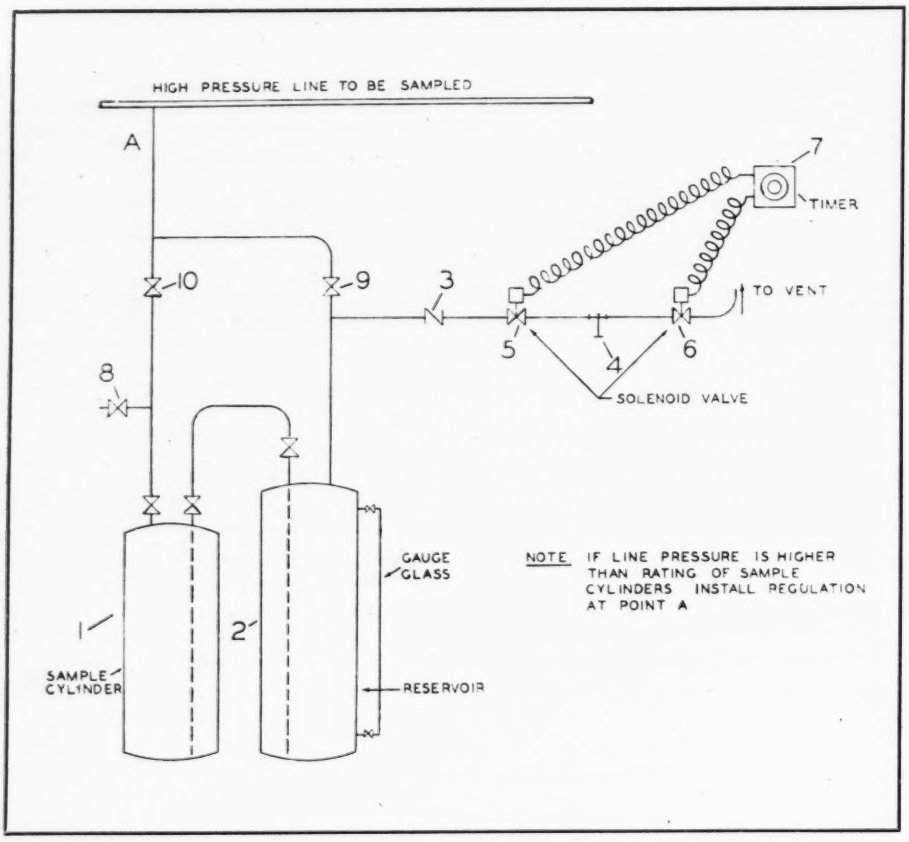
The reformed gas is led to a cooling tower and ultimately to storage holders. Pressure generated in the process eliminates the need for exhausters. The process is carefully controlled at all times through a special control panel which records temperatures, rates of flow, and pressures, and analyzes the gas mixture. Once in operation, the unit needs only periodic checking by one operator.

Automatic Flow Reversal

Periodic reversing of the flow of gas or other raw material into the furnace is done for the purpose of keeping temperature gradients within the furnace more constant. Since the furnace is hottest in its center, gas heated at the center would spread the heat to one end of the furnace, while the other end would tend to become much cooler because of the influx of unheated gas. Reversing the flow each minute keeps the hottest temperature in the center of the furnace, resulting in a uniform quality of gas. Reversing is automatic.

For meeting peak load requirements the equipment can be started cold and will be operating at near capacity in one hour's time. Changeovers from one type of fuel to another can be made in whatever time it takes to regulate valves and adjust heat conditions.

The Rochester unit occupies a space only 42 by 21 ft and, except for the cooling tower, is less than 10 ft high. It could have been condensed into even smaller space had it been necessary, without sacrificing the ease of its operation.



Apparatus used to collect gas sample at high pressure for removal to the nearest calorimeter for test. Sample is collected at a uniform rate through water displacement principle.

An Automatic High Pressure Sample Device for Heat Value Determination

By M. A. RICHFORD
Pacific Gas & Electric Co.

• *This article was developed under the auspices of the Pacific Coast Gas Assn. to be published as a companion piece to the study, "Continuous, Automatic Sampling of Fuel Gases in Transmission and Distribution Systems," by W. A. McGlashen and J. S. Powell of Southern California Gas Co., Los Angeles. The latter paper, presented before the 1951 Technical Services Conference of PCGA, appeared in September GAS, pp. 49-52.*

While operating on widely different mechanical principles, the devices described in both articles were designed to achieve automatic and methodical, rather than manual, spot, sampling.

IT happens, occasionally, that the strategic sampling point for heating values on a gas system is at some distance from operating headquarters. Locating a calorimeter station for making tests at such a sampling point might result in high installation costs, while spot sampling for testing elsewhere can be costly in frequent trips or undesirable because of the inadequacy of spot sampling to accurately portray the average quality of the gas. In such a situation, a practical solution is to collect a sample over a seven-day period in a small container at high pressure for transportation to the nearest calorimeter.

An apparatus used by Pacific Gas & Electric Co. to collect such a sample at high pressure is shown schematically in the illustration. Displacement of water is employed. The collection of the sample is carried out at a uniform rate by admitting small equal increments to the sample cylinder at regular intervals so as to secure at the end of the allotted time a full cylinder of true sample gas at line pressure. The cylinder is picked up once a week and sent to the company's nearest recording calorimeter for test. The individual parts of the apparatus are as follows:

Parts of the Apparatus

Item 1 is a high pressure sample cylinder (containing a dip pipe) which is full of water at the start of the sampling period.

Item 2 is a reservoir for the storage of water displaced from Item 1 during the sampling period, Valves (8) and (9) being closed and Valve (10) open.

A sample cylinder is made ready for a new sample by filling it with water, which is accomplished by opening Valve (9), introducing line gas to the reservoir, and expelling the sample cylinder's residual gas contents through open Valve (8).

Item 3 is a regulator or regulators to reduce line pressure to inches of water column.

Item 4 is a capped nipple or other reservoir to which oil can be added or removed for precise adjustment of the volume of the sample increment.

Items 5 and *6* are solenoid valves.

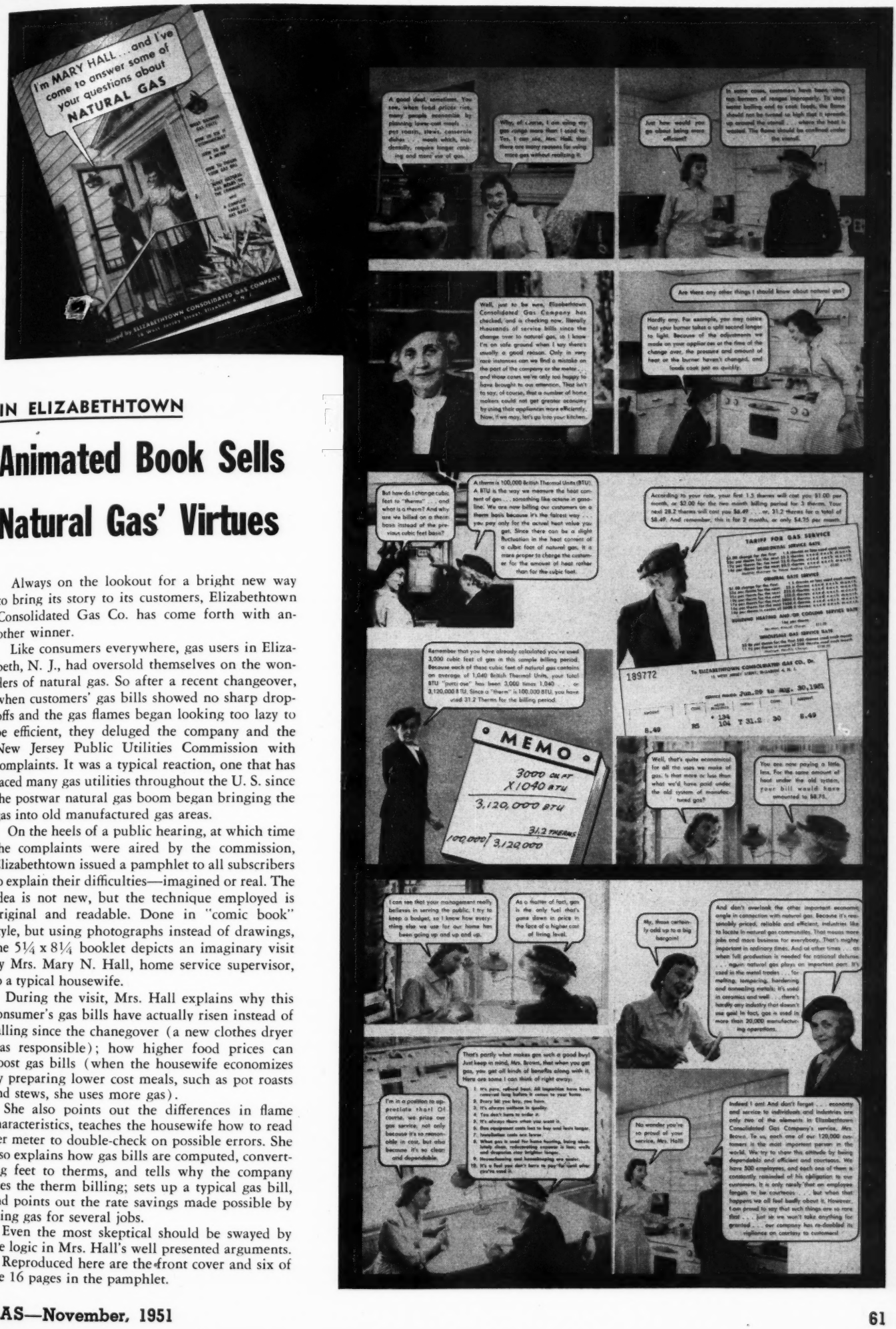
Item 7 is an electric timer to open and close the solenoid valves individually at regular intervals of time.

In operation, the timer opens and closes solenoid (6) so as to exhaust the volume of low pressure gas trapped in the space between (5) and (6) to atmosphere; then solenoid (5) is opened and closed to refill the exhausted space. This refilling produces a definite gas volume reduction in reservoir (2) and causes a transfer of an equivalent volume of water from (1) to (2) which in turn allows a like quantity of sample to enter the sample cylinder.

Recommended Sizes

Practical sizes for the parts of the equipment are for items (1) and (2), 1.0 cu ft and 2.0 cu ft space capacity, respectively, both rated for 175 psig. A timer making four cycles per hour will require for a seven-day sample approximately 3 cu in. of space capacity between the solenoids at a pressure of 4 to 6 in. w. c. Operating the solenoids on low pressure gas is preferable in order to minimize leakage.

The sample thus obtained is ample for a calorimeter test. It will be saturated with water but that is immaterial in calorimetry work. Selective absorption of constituent gases is negligible due to repeated use of the same water. Furthermore, in most natural gas systems, the daily variation in gas quality is small, thus further reducing selective absorption.


I'm MARY HALL . . . and I've come to answer some of your questions about NATURAL GAS
ELIZABETHTOWN CONSOLIDATED GAS COMPANY
A good deal, sometimes. You see, when food prices rise, many people economize by planning lower-cost meals . . . pot roasts, stews, casserole dishes . . . meals which, incidentally, require longer cooking and more use of gas.
Why, of course, I am using my gas range more than I used to. Yes, I can see, Mrs. Hall, that there are many reasons for using more gas without realizing it.
Just how would you go about being more efficient?
In some cases, customers have been using too burners of ranges improperly. To start water boiling and to cook foods, the flame should not be turned so high that it spreads up around the utensil . . . where the heat is wasted. The flame should be confined under the utensil.
Well, just to be sure, Elizabethtown Consolidated Gas Company has checked, and is checking now, literally thousands of service bills since the change over to natural gas, so I know I'm on safe ground when I say there's usually a good reason. Only in very rare instances can we find a mistake on the part of the company or the meter . . . and those cases we're only too happy to have brought to our attention. That isn't to say, of course, that a number of home makers could not get greater economy by using their appliances more efficiently. Now, if we may, let's go into your kitchen.
Are there any other things I should know about natural gas?
Hardly any. For example, you may notice that your burner takes a split second longer to light. Because of the adjustments we made on your appliances at the time of the change over, the pressure and amount of heat at the burner haven't changed, and foods cook just as quickly.
But how do I change cubic feet to "therms" . . . and what is a therm? And why are we billed on a therm basis instead of the previous cubic feet basis?
A therm is 100,000 British Thermal Units (BTU). A BTU is the way we measure the heat content of gas . . . something like octane in gasoline. We are now billing our customers on a therm basis because it's the fairest way . . . you pay only for the actual heat value you get. Since there can be a slight fluctuation in the heat content of a cubic foot of natural gas, it is more proper to charge the customer for the amount of heat rather than for the cubic foot.
According to your rate, your first 1.5 therms will cost you $1.00 per month, or $2.00 for the two month billing period for 3 therms. Your next 28.2 therms will cost you $8.49 . . . or, 31.2 therms for a total of $8.49. And remember, this is for 2 months, or only $4.25 per month.
TARIFF FOR GAS SERVICE
189772
To ELIZABETHTOWN CONSOLIDATED GAS CO. Dr.
Service period Jun. 29 to Aug. 30, 1951
Remember that you have already calculated you've used 3,000 cubic feet of gas in this sample billing period. Because each of these cubic feet of natural gas contains an average of 1,040 British Thermal Units, your total BTU "purchase" has been 3,000 times 1,040 . . . or 3,120,000 BTU. Since a "therm" is 100,000 BTU, you have used 31.2 Therms for the billing period.
MEMO
3000 CU FT
X1040 BTU
3,120,000 BTU
31.2 THERMS
100,000 / 3,120,000
Well, that's quite economical for all the uses we make of gas. Is that more or less than what we'd have paid under the old system of manufactured gas?
You are now paying a little less. For the same amount of heat under the old system, your bill would have amounted to $8.75.
I can see that your management really believes in serving the public. I try to keep a budget, so I know how everything else we use for our home has been going up and up and up.
As a matter of fact, gas is the only fuel that's gone down in price in the face of a higher cost of living level.
My, those certainly add up to a big bargain!
And don't overlook the other important economic angle in connection with natural gas. Because it's reasonably priced, reliable and efficient, industries like to locate in natural gas communities. That means more jobs and more business for everybody. That's mighty important in ordinary times. And at other times . . . as when full production is needed for national defense. . . . again natural gas plays an important part. It's used in the metal treaters . . . for melting, tempering, hardening and annealing metals; it's used in ceramics and well . . . there's hardly any industry that doesn't use gas! In fact, gas is used in more than 20,000 manufacturing operations.
That's partly what makes gas such a good buy! Just keep in mind, Mrs. Brown, that when you get gas, you get all kinds of benefits along with it. Here are some I can think of right away:
1. It's pure, refined heat. All impurities have been removed long before it comes to your home.
2. Every bit you buy, you burn.
3. It's always uniform in quality.
4. You don't have to order it.
5. It's always there when you want it.
6. Gas equipment costs less to buy and lasts longer.
7. Installation costs are lower.
8. When gas is used for home heating, living absolutely dusts, redecorating expense is less; walls and draperies stay brighter longer.
9. Housecleaning and housekeeping are easier.
10. It's a fuel you don't have to pay for until after you've used it.
I'm in a position to appreciate that! Of course, we prize our gas service, not only because it's so reasonable in cost, but also because it's so clean and dependable.
No wonder you're so proud of your service, Mrs. Hall!
Indeed I am! And don't forget . . . economy and service to individuals and industries are only two of the elements in Elizabethtown Consolidated Gas Company's service, Mrs. Brown. To us, each one of our 120,000 customers is the most important person in the world. We try to show this attitude by being dependable and efficient and courteous. We have 500 employees, and each one of them is constantly reminded of his obligation to our customers. It is only rarely that an employee forgets to be courteous . . . but when that happens we all feel badly about it. However, I am proud to say that such things are so rare that . . . just as we won't take anything for granted . . . our company has re-doubled its vigilance on courtesy to customers!

IN ELIZABETHTOWN

Animated Book Sells Natural Gas' Virtues

Always on the lookout for a bright new way to bring its story to its customers, Elizabethtown Consolidated Gas Co. has come forth with another winner.

Like consumers everywhere, gas users in Elizabeth, N. J., had oversold themselves on the wonders of natural gas. So after a recent changeover, when customers' gas bills showed no sharp drop-offs and the gas flames began looking too lazy to be efficient, they deluged the company and the New Jersey Public Utilities Commission with complaints. It was a typical reaction, one that has faced many gas utilities throughout the U. S. since the postwar natural gas boom began bringing the gas into old manufactured gas areas.

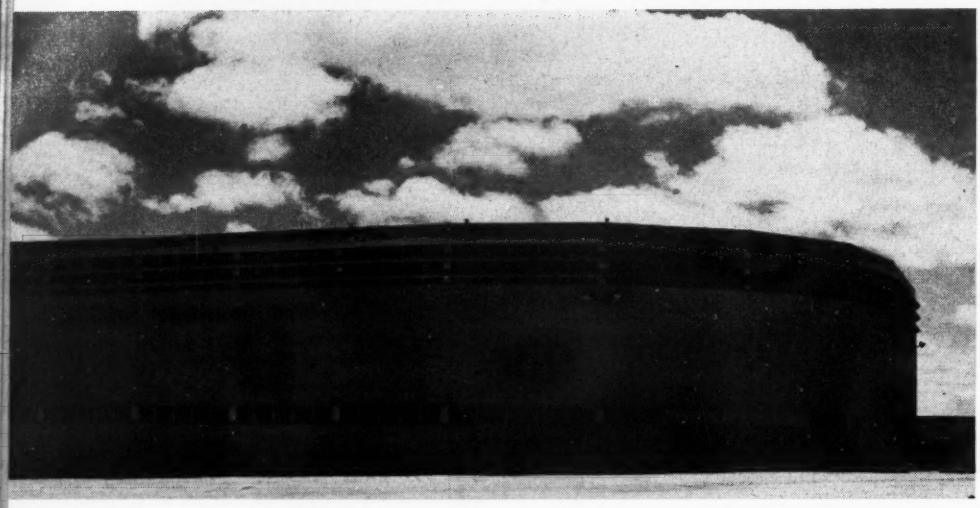
On the heels of a public hearing, at which time the complaints were aired by the commission, Elizabethtown issued a pamphlet to all subscribers to explain their difficulties—imagined or real. The idea is not new, but the technique employed is original and readable. Done in "comic book" style, but using photographs instead of drawings, the 5¼ x 8¼ booklet depicts an imaginary visit by Mrs. Mary N. Hall, home service supervisor, to a typical housewife.

During the visit, Mrs. Hall explains why this consumer's gas bills have actually risen instead of falling since the chanegover (a new clothes dryer was responsible); how higher food prices can boost gas bills (when the housewife economizes by preparing lower cost meals, such as pot roasts and stews, she uses more gas).

She also points out the differences in flame characteristics, teaches the housewife how to read her meter to double-check on possible errors. She also explains how gas bills are computed, converting feet to therms, and tells why the company uses the therm billing; sets up a typical gas bill, and points out the rate savings made possible by using gas for several jobs.

Even the most skeptical should be swayed by the logic in Mrs. Hall's well presented arguments.

Reproduced here are the front cover and six of the 16 pages in the pamphlet.



Faced with native stone brick and aluminum, the Alamo stadium gym at San Antonio is attractive as well as functional. The eight double doors in the photograph close one of the main exits. Upper windows have aluminum blinds; lower windows are stationary. Four strategically placed gas-fired heaters provide year-around air conditioning.

How Four Units Heat 1½-Million Foot Gym

HOW to maintain uniformly comfortable temperatures for spectators in a huge new stadium-type public school gymnasium at San Antonio, Texas, was the problem that confronted the designers of the U-shaped structure which contains nearly 1½ million cu ft of enclosed space.

Because it will be used during all seasons, the structure had to be equipped with a heating and ventilating system of sufficient air-handling capacity to maintain satisfactory temperatures with warm air during cold weather and to provide ventilation during hot weather.

This was accomplished economically through the installation of only four automatically controlled, gas-fired Dravo warm air space heaters.

Ventilate in Summer

Each unit has a heat output capacity of 650,000 Btu per hour and can be operated with the burners off during the summer months to ventilate the structure. Together the four heaters handle approximately 28,600 cu ft of air per minute.

The spectators' section of the structure consists of 28 concentric concrete tiers with wooden bench-type seats. Entrances to the stadium are located at the closed end of the "U." Two ramps lead from the concourse under the seats into the amphitheater. Two main exitways are in the wall which closes the upper part of the "U."

Accommodations for players, officials, and concession stands are located in various sections of the structure, mostly beneath the tiers of seats. Players are provided with bull pens, a dormitory, four large dressing rooms, two shower and drying rooms, and a clinic and treatment room. There also is an office for staff employees.

Three rows of steel-framed windows, which are pivoted for outdoor air ventilation, extend around the entire "U" of the gym, 2 ft, 2½ in. below the roof line. Each row of these windows is protected by a continuous aluminum blind to keep out sun rays. Two rows of stationary steel sashed windows encircle the "U," just above door height, to provide light for the area beneath the stands.

One of the four heaters shown suspended from roof truss work. Maintenance platforms at bottom of the heater are attached to extensions of angles from which heaters are suspended.

The tar and gravel roof is supported by open truss work which rests on steel posts placed to give maximum visibility to all spectators.

The exterior of the building is faced with native stone to a height equal to that of the entrance and exit doors. The balance of the building is faced with brick and aluminum which reflects heat from the sun during warm weather.

The amphitheater is heated entirely by the four units, suspended in an inverted position from the ceiling truss work.

Three Nozzles

Each heater is equipped with three nozzles which are directed to discharge air parallel to the sloping tiers of seats but not directly on the spectators. With this arrangement, the seating area and gym floor are "blanketed" with air, either warm air for winter heating or recirculated air for summer ventilating.

The four heaters are strategically spaced to achieve maximum uniformity of air distribution. Their louvered discharge nozzles can be rotated a full 360° to help establish the "air blanket." Platforms are erected around each heater to provide easy accessibility for servicing. Transite stacks carry exhaust fumes from the heaters out through the roof.

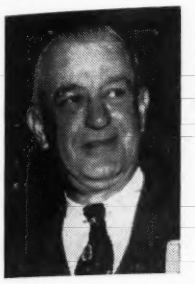
In operation, the heaters pull large volumes of air into their casings through louvered intake openings. During cold weather, the temperature of the intake air is raised approximately 80°F, as it sweeps each heater's stainless steel combustion chamber. Then it is discharged from the outlet nozzles at a velocity of from 2000 fpm without creating annoying drafts or subjecting spectators to blasts of hot air.

Continuous recirculation of air through the heaters is a big factor in their operating economy. As warm air rises toward the roof, large volumes are caught in the heaters' intake air path and drawn back into the recirculation pattern. This air therefore is not wasted in the upper strata of the building, and heat losses through the roof are minimized.

In warm weather, the heaters circulate air in exactly the same manner but their burners are not turned on.

PEOPLE

At a recent board of directors meeting of Brooklyn (N. Y.) Union Gas Co., HUGH H. CUTHRELL was elected president, succeeding CLIFFORD E. PAIGE, who will remain as chairman of the board, and JOHN E. HEYKE was elected executive vice president. Vice President BENJAMIN G. NEILSON, soon to retire, resigned as a director



Hugh Cuthrell

John Heyke

and member of the executive committee and Mr. Cuthrell was elected to these offices. Mr. Cuthrell, with Brooklyn Union for the past 24 years in various executive posts, served as 1949-50 president of the American Gas Assn. and is currently a director and member of the AGA executive committee. Mr. Heyke began his Brooklyn Union career as a cadet engineer. He worked in the new business department and house heating division before becoming assistant personnel director in 1940. After time out for Navy service, he became assistant vice president in 1945 and vice president in 1948.

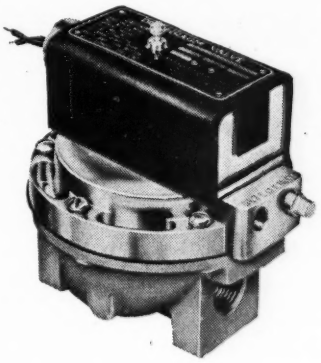
RICHARD A. ROSAN, associated with the law firm of Cravath, Swaine & Moore of New York since 1936, has joined the legal department of Columbia Gas System Inc., New York. Since 1945 Mr. Rosan has worked almost exclusively on legal affairs connected with the system's integration proceedings, financing, and recently with rate matters, which will be one of the responsibilities of his new position.

Central Arizona Light & Power Co., Phoenix, has announced the retirement of EDWARD H. COE after 26 years as an officer of the company. Mr. Coe joined Calapco in 1925 as vice president and general manager and became president in 1934. In 1943 he was confined to his home for a year because of illness, and he resigned as president in 1946. Since that time he has served as chairman of the board's executive committee and supervisor of general corporate matters. Because of his outstanding service, Mr. Coe has been named honorary chairman of the executive committee, and he will continue as a member of the board. Among his contributions as president of Calapco were the sale and transfer of the company from holding company owners to stockholders and the institution of local management and control.

Edward H. Coe

Want to be "sitting pretty" too?

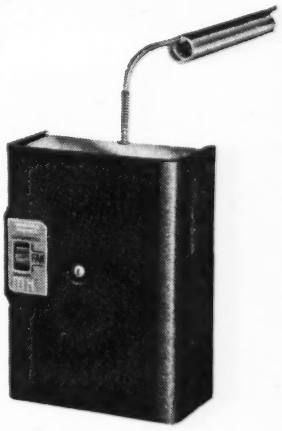
Then you'll want to promote the use of trouble-free Honeywell controls like these.



Honeywell diaphragm gas valve

The new V899 is a real engineering triumph. It fits far smaller spaces than previous valves, yet often exceeds them in capacity, retains all the performance features dealers have liked so well. And thorough field tests have proved its quietness and exceptional dependability. Available now in 1½" and 2" sizes, the V899 is interchangeable with most solenoid valves. Manual opener, or manual opener with automatic recycling, optional.

Combination Furnace Control



Honeywell's new L486 Flexible Element Combination Furnace Control provides, for the first time, positive furnace protection. If the single sensing element should rupture for any reason, it breaks the burner circuit and starts the fan. This means it's *fail-safe*. The L486 can be mounted inside or outside the furnace casing, or remotely—up to 60 inches from the sensing element. Easily accessible summer-winter switch and many other features are additional reasons why it's fast becoming a dealer favorite.

For full facts on any of the above equipment, write today to Minneapolis-Honeywell, Department GS-11-219, Minneapolis 8, Minn.

MINNEAPOLIS **Honeywell**

H HONEYWELL

First in Controls

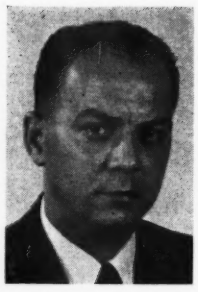
R. C. Servat
. . . General Controls

W. E. Bambrick
. . . Caloric

General Controls Co., Glendale, Calif., has announced the appointment of ROBERT C. SERVAT as branch manager of the company's new office in New Orleans. Mr. Servat will be in complete charge of branch office activities, including sales, engineering, and service.

Caloric Stove Corp., Philadelphia, has named WILLIAM E. BAMBRICK as divisional manager for Arkansas, Oklahoma, Mississippi, and Louisiana. Mr. Bambrick, with headquarters at Baton Rouge, La. has been with Caloric as a district representative since 1947.

CHARLES M. RUTTER has been appointed corrosion engineer, distribution department, Equitable Gas Co., Pittsburgh. Mr. Rutter will investigate causes of line corrosion and make recommendations for protective measures as well as study corrosion possibilities where new lines are being installed and old lines extended. In addition, he will make long-range studies in cooperation with the corrosion subcommittee of the Pittsburgh public service coordination committee and corrosion engineers of other companies with underground facilities in Equitable's territory. Mr. Rutter, a member of the National Assn. of Corrosion Engineers, has been associated with the company since 1940.



C. M. Rutter
. . . Equitable

C. C. Westmoreland
. . . SoCal

Several personnel changes have been announced by Southern California Gas Co., Los Angeles, including the assignment of C. C. WESTMORELAND as coordinator between the company and various local government agencies, and as general supervisor of the ordinance bureau. In the latter position, he replaces L. E. HENRY, newly appointed southwest division service supervisor. P. L. SPEERS succeeds Mr. Westmoreland as staff assistant, customer service training, and W. P. HOLDERNESS will take over Mr. Speers' position as supervisor of quality control. E. F. HAWKESWORTH, appointed to the methods and procedures committee, turns over his duties as general supervisor of central stores to G. A. ABSHER, with G. E. MONSON replacing Mr. Absher as acting store supervisor.

Recent personnel changes at Consumers Power Co., Jackson, Mich. include the promotion of E. HARDY LUTHER, former assistant to the Kalamazoo division manager, to general training and educational supervisor at Jackson; BIRUM G. CAMPBELL JR., former South Oakland district manager to succeed Mr. Luther; ARTHUR H. LEE, assistant to the Bay City division manager to replace Mr. Campbell; and ANSON HEDGECOCK has been appointed Cadillac district manager replacing SOLON W. WEBB, soon to retire.

Johns-Manville Corp., New York, has named DON L. HINMON as assistant manager of the company's transite pipe department, succeeding E. A. PHOENIX, recently appointed manager of market surveys. Mr. Hinmon joined the company in 1936 as a sales representative, in 1945 became transite pipe staff manager for the Los Angeles industrial products division, and since 1948 has been manager of the aviation industry section of the special industries department, with headquarters in New York city.

The Welsbach Corp., Kitson Division, Philadelphia, has extended the sales territory of H. EMORY PEDDICORD to include the plumbing and heating wholesalers in the District of Columbia and Arlington and Rosslyn, Va., as well as those in his present territory. Mr. Peddicord headquarters in Baltimore.

TWO NAMES TO REMEMBER FOR HELP WHEN YOU NEED IT

— OR BEFORE

COMMONWEALTH SERVICES · INC.
ASSOCIATES · INC.

This is a day of technical, economic, social and regulatory changes and developments — numerous and fast-breaking. It calls for specialization in nearly every phase of business.

Commonwealth Services and its engineering subsidiary Commonwealth Associates are a compact group of specialists, skilled in team-work, accustomed to detailed attention to clients' needs. Experience records in electric and gas utility work cover over 40 years.

Here is a ready made supplementary staff for you, on call at your convenience for specific problems, projects, or continuing programs.

Check the ways in which Commonwealth can contribute to the efficiency and economy of your organization. Write for booklet describing the many services available to you. Address: Commonwealth Services Inc., Department B2, 20 Pine Street, New York 5, N. Y.

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ABILITY • EXPERIENCE • RESOURCEFULNESS • RESULTS

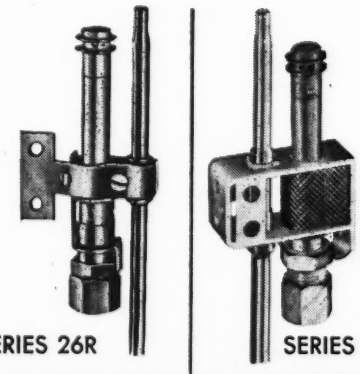
NOW!

NEW "GG" WATER HEATER CONTROL

BY

GENERAL CONTROLS

Grayson-Greenamyer
Appliance Controls Division



SERIES 26R

SERIES 260

OPTIONAL... **AGA and UL APPROVED PILOT BURNERS**

100% SAFETY SHUT-OFF...

TOP QUALITY...AT LOWER COST

Here is the *new* GENERAL CONTROLS water heater control—the GG-2 model, that delivers safe, efficient operation at remarkable cost saving figures.

Its new, simplified design assures years of trouble-free performance. Built for all gases, it offers 100% shut-off, easy servicing with standard tools.

Notice the "all in one" single couple pilot burner,—its unique design provides stable ignition and thermocouple flame regardless of gas pressure, altitude or primary air conditions.

This General Controls water heater control is news in the appliance field today. Immediate delivery, write for Catalog GG-2.

GENERAL CONTROLS

801 ALLEN AVENUE GLENDALE 1, CALIFORNIA

GRAYSON-GREENAMYER APPLIANCE CONTROLS DIVISION

FACTORY BRANCHES: Baltimore, Md., Birmingham, Ala., Boston, Mass., Buffalo, N.Y., Chicago, Ill., Columbus, Ohio, Cleveland, Ohio, Dallas, Texas, Denver, Colo., Detroit, Mich., Houston, Texas, Indianapolis, Ind., Kansas City, Mo., Milwaukee, Wis., Minneapolis, Minn., Newark, N.J., New York, N.Y., Omaha, Neb., Philadelphia, Pa., Pittsburgh, Pa., St. Louis, Mo., Salt Lake City, Utah, San Francisco, Calif., Seattle, Wash., Tulsa, Okla., Washington, D.C., Los Angeles, Calif.

H. O. Vaars

R. J. Munn

Rockwell Manufacturing Co., Pittsburgh, has announced the promotion of R. J. MUNN to assistant sales manager of oil field products and of H. O. VAARS to sales engineer in charge of water and gas utilities and LP-Gas accounts in Wisconsin and upper Michigan. Mr. Munn was previously sales engineer in the Houston district office of the Nordstrom valve division, and for several years was in charge of the Corpus Christi office. Mr. Vaars was formerly associated with Perfection Stove Co., Cleveland, and Pittsburgh Valve & Fittings Corp., Barberton, Ohio.

Four home economists have been added to the staff of Manufacturers Light & Heat Co., Pittsburgh. They are LENORE RETZER, with headquarters in Washington, Pa., replacing DOROTHY CRAWFORD LONGMORE, now located at the company's Hilltop home service center in Pittsburgh; JANET EVANS, with headquarters in New Brighton, Pa.; JOAN OVERHOLT, with headquarters in Gettysburg, replacing LOUISE FRAZIER, on leave of absence for post-graduate study at Ohio State University; and JEAN SLAVIN, with headquarters in New Castle, Pa., replacing ALICE LEBAN, now in a government position in Nurenburg, Germany. DOROTHY FARRELL has been appointed home economist for Binghamton (N. Y.) Gas Works, replacing JANE MARSHALL, who is also on leave for work at Ohio State.

Servel Inc., Evansville, Ind., has named FRANK S. REID regional appliance service manager for the northern section of the company's west coast region including Washington, Oregon, Idaho, Montana, northern California and Nevada. Mr. Reid, who joined Servel in 1937 as a sales engineer, and since 1946 has been a factory representative, will headquarter in Portland, Ore. Other appointments include TOWNSEND COOPER, former advertising production manager for Mead Johnson & Co., Evansville, as director of creative planning and production, and C. W. HEDMARK as manager of apartment house sales in the company's Chicago branch.

A change in officers of United Gas Corp., Shreveport, was recently announced. J. H. MIRACLE, former secretary, was elected a vice president, and B. H. WINHAM, assistant to the president, was elected secretary. Mr. Miracle has been with the corporation since 1931, was elected secretary of United's subsidiaries in 1937, and became secretary in 1946. Mr. Winham, also with United for 20 years, was named assistant to the president in 1947.

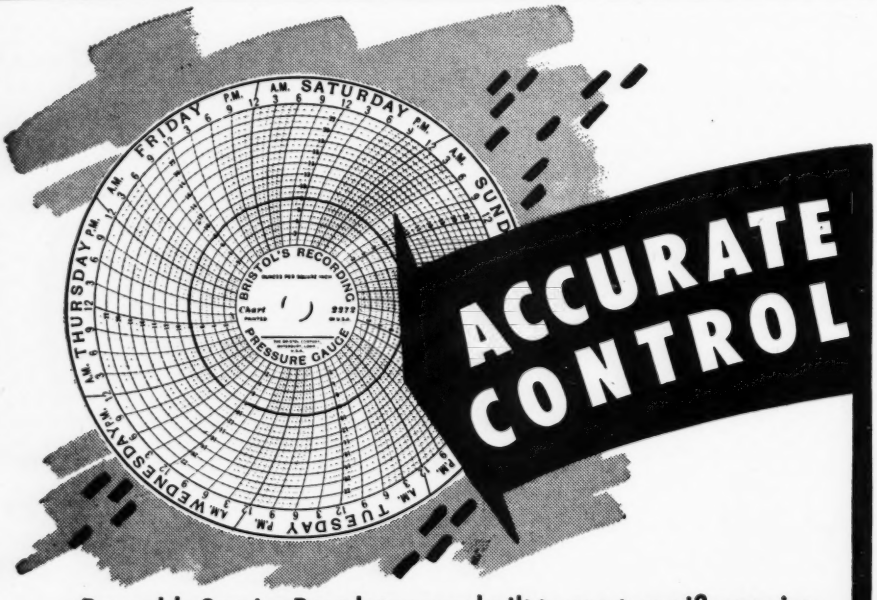
LE ROY EDWARDS, former vice president and general counsel of Southern California Gas Co., Los Angeles, took the oath of office as a member of the Los Angeles City Board of Education on Sept. 27. Mr. Edwards presently serves as a member of the board of directors of Southern California and Southern Counties Gas Co's.

Announcement of the appointment of EARL B. CUTTER as assistant to the vice president in charge of sales has been made by American Meter Co., New York. Mr. Cutter joined the company in 1939, was on military leave from 1941 to 1946, and since that time has been active in sales in the midwest.

E. B. Cutter
. . . American Meter

A. A. Maust
. . . Peoples Nat.

ARTHUR A. MAUST has been appointed sales division dealer relations supervisor of Peoples Natural Gas Co., Pittsburgh. Mr. Maust, who will have charge of the company's dealer relations staff and program throughout western Pennsylvania, succeeds PAUL E. BEECH, who recently joined A. O. Smith Corp.



Reynolds Service Regulators are built to meet specific requirements — years of operation in the field through a complete range of operating conditions have proved not only their superiority but their durability. With parts so precisely machined for each model that they are completely interchangeable. The accuracy you require in performance is assured.

MODEL 10

Dead Weight or Spring Type, with or without Mercury Seal, or Dead Weight Safety Seal or diaphragm operated relief valve. All working parts are so accessible as to be interchangeable without removal from pipe line.

MODEL 20

Dead Weight or Spring Type, with or without Mercury Seal, or Dead Weight Safety Seal or diaphragm operated relief valve. All working parts are so accurate as to permit complete interchangeability in shop.

MODEL 30

For horizontal or vertical connections, with or without removable valve pocket. Available with either Spring or Dead Weight adjustment. With or without Mercury or Dead Weight Safety Seal or diaphragm operated relief valve.

Reynolds Gas Regulator Co.
ANDERSON, INDIANA, U. S. A.

GAS CONTROL SINCE 1892

She saw this ad

BETTER HOMES & GARDENS
SATURDAY EVENING POST
GOOD HOUSEKEEPING
AMERICAN HOME
HOUSE BEAUTIFUL
PARENTS'

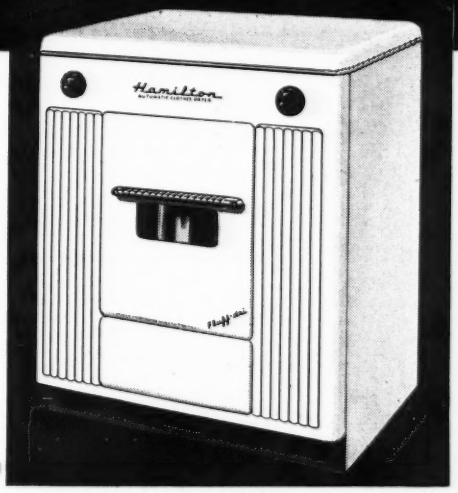
Hamilton

...from you?

MAKE SURE YOU MAKE THE SALES...
MAKE USE OF THIS
HAMILTON ADVERTISING MATERIAL!

- New Billboards
- Envelope Stuffers
- A complete new direct mail campaign
- Special sales presentation that works free . . . to sell more Hamilton Dryers for you

HAMILTON MANUFACTURING COMPANY · TWO RIVERS, WISCONSIN



Exclusive Hamilton Features:

Patented "Carrier Current" drying action cradles clothes in warm air.

Hi-Power Exhaust System controls condensation and linting problems.

Sun-E-Day Ultra Violet Lamp leaves clothes fresher, sweeter.

Hamilton Lint Control, twice as efficient, far easier to clean.

Taylor Nelson

TAYLOR G. NELSON has joined Minneapolis-Honeywell Regulator Co. as eastern sales manager of the Appliance Controls Division, which has headquarters and manufacturing facilities in Los Angeles. Mr. Nelson will be located in Cleveland. For 10 years he has been associated with Titan Valve & Manufacturing Co., Cleveland, for the past few years as vice president and sales manager. Mr. Nelson is well known throughout the industry and in the Controls and Related Accessories division of GAMA in which he has been active on many committees in the past several years.

ALFRED A. BECKER has been promoted to assistant superintendent in the northern division by Cincinnati (Ohio) Gas & Electric Co. Mr. Becker, formerly supervisor of distribution-operation, joined the company in 1936 as a timekeeper and later served as a draftsman in the gas distribution engineering department.

Two recent executive promotions by Washington (D. C.) Gas Light Co. include OTIS H. RITENOUR, former comptroller to vice president and CARROLL C. PIKE, assistant comptroller, to succeed Mr. Ritenour. Both men are long-time employees of Washington Gas, Mr. Ritenour having joined the company in 1925 and Mr. Pike in 1930.

J. F. Skidmore

Two recent promotions by Equitable Gas Co., Pittsburgh, include the appointment of J. FRANK SKIDMORE, supervisor of system operations since 1942, as transmission engineer, and of HOWARD R. SHIVELY, as Mr. Skidmore's replacement. Mr. Skidmore, a member of the Engineers Society of Western Pennsylvania, became associated with Equitable in 1936 and has served as station engineer, cadet engineer and system operator. Mr. Shively, with the company since 1935, was until his promotion assistant supervisor of system operations.

Personnel changes at Lone Star Gas Co., Dallas, include appointment of JACK CHERRY as manager of the Arlington district; FLOYD W. HARRIS, long-time employee of the Fort Worth division office, as manager of the Grand Prairie district; E. E. MADDING, local manager at Goldthwaite, as manager at Hamilton, replacing the late E. H. ARBUCKLE; and ELLIS GOODNIGHT as manager of the subdistrict office at Madisonville, succeeding JACK D. PACK, who recently resigned.

At a recent board of directors meeting, WILLIAM A. LYONS was elected vice president of New York State Electric & Gas Corp., Ithaca. In addition to his present duties as assistant to the president, which includes direction of the company's public relations activities, Mr. Lyons will direct residential and commercial sales throughout the state. Associated with the company's affiliated utility companies since 1929, Mr. Lyons served on the War Production Board in an executive capacity during World War II and was later consultant to the Civilian Production Administration and National Security Resources Board.

W. A. Lyons
. . . N. Y. State

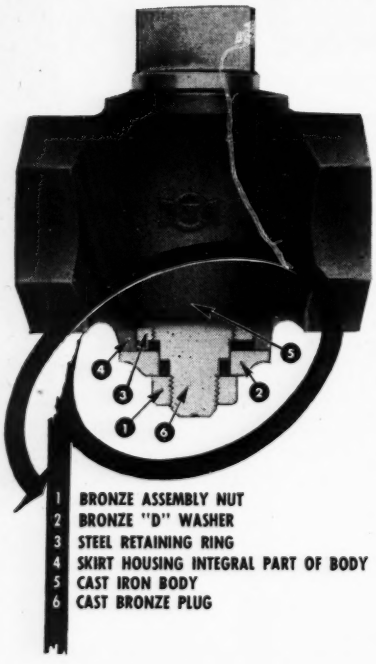
Harold Tiley
. . . Caloric

Appointment of HAROLD TILEY as general sales manager was recently announced by Caloric Stove Corp., Philadelphia. Mr. Tiley, field sales manager for the last two years, joined the company in 1929 as a representative, was in charge of the Conservator division during the war, became assistant sales manager in 1945, and was appointed northeastern sales manager in 1947.

HAYS®

TAMPER-PROOF GAS STOPS

FEATURES


1 BRONZE ASSEMBLY NUT
2 BRONZE "D" WASHER
3 STEEL RETAINING RING
4 SKIRT HOUSING INTEGRAL PART OF BODY
5 CAST IRON BODY
6 CAST BRONZE PLUG

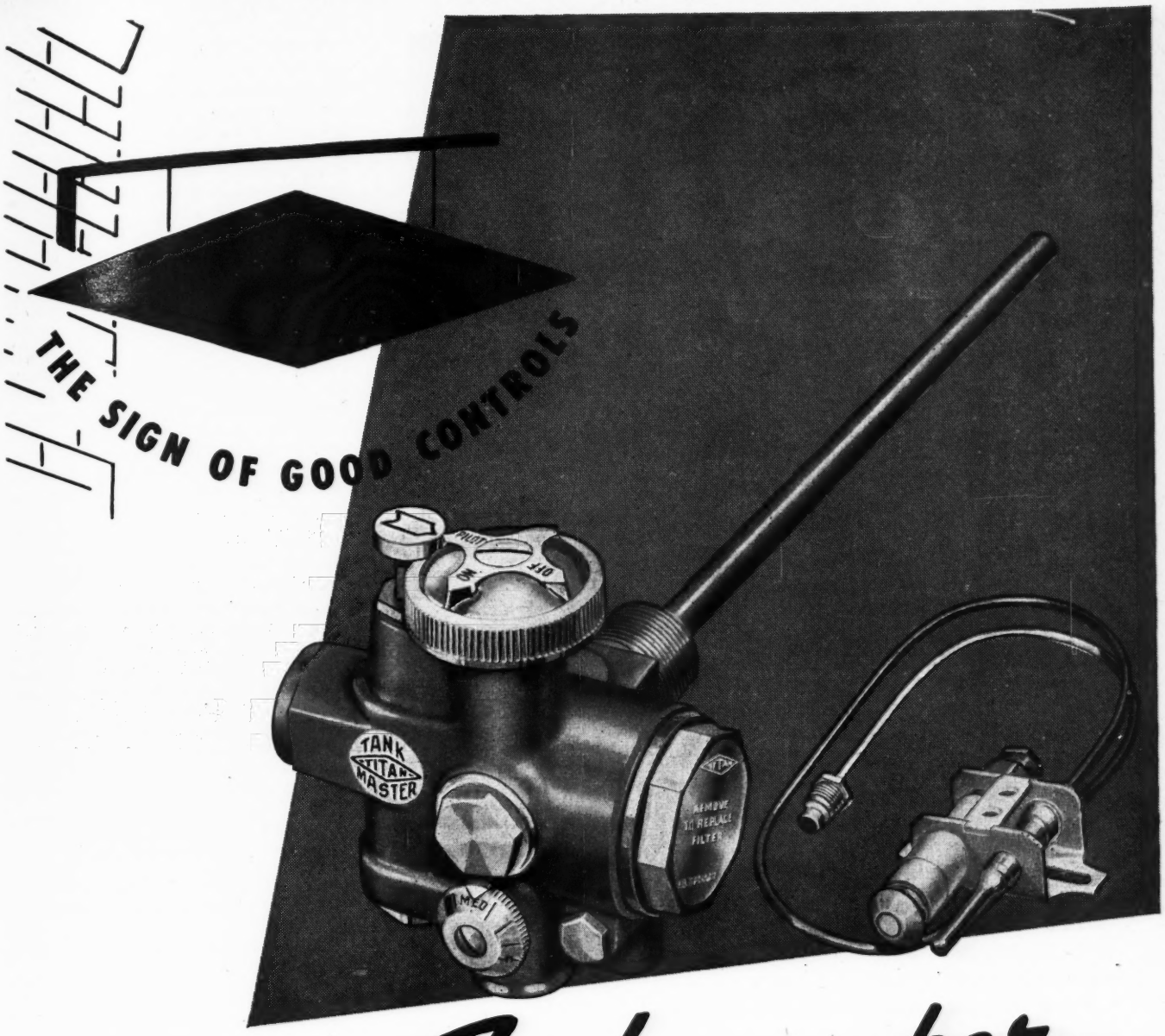
- Tamper-Proof Design with Non-Removable Plug.
- Extra Grade Gray Iron Body, Gas Service Bronze Plug.
- Steel Retaining Ring Prevents Removal of Plug.
- Steel Retaining Ring Assembled to Bottom of Plug—Eliminates Possible Damage to Precision Ground Surface of Plug and Body.
- Steel Retaining Ring Threaded and Staked to the Largest Metal Diameter on Bottom of Tapered Plug—Assures Retention without Distortion.
- Steel Retaining Ring Anchored without Drill Hole or Pin—Eliminates Possible Shearing of Plug.
- Steel Retaining Ring Located below Shoulder of Body—Permits Freedom for Service Adjustment of Plug.
- Steel Retaining Ring Recessed and Inaccessible within Iron Body—Gripless and Shearless.
- Plug and Body Precision Ground and Matched for Perfect Seating.
- Individually Tested Under Rigidly Controlled Inspection.
- Lubricated with a Compound of Greases Suitable for Use with Manufactured, Natural or Liquid Petroleum Gases.
- Obtainable in a Variety of Patterns.

Write for Folder 120-C D

AVAILABLE IN
Black or Galvanized
Flat Head Less Check
Flat Head With Check
Flat Head With Lock-Wing
Sizes; ¾"—1"—1¼"—1½"—2"

Also HAYS STANDARD
HEAVY PATTERN IRON BODY GAS STOP

For 75 Years the Gas Industry has relied on HAYS Iron Body Gas Stops



Titan Tankmaster -

THE OUTSTANDING TITAN CONTROL

OUTSTANDING because of the large capacity and the extra large, removable filter.

OUTSTANDING because of the metal to metal valve and seat—a real engineering triumph.

OUTSTANDING because it is designed for use with all gases—through the TITAN Snap Action Mechanism—and with 100% Safety Pilot and Safe Lighting.

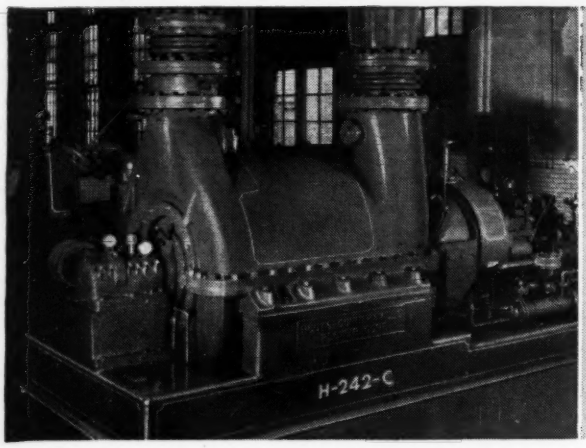
TITAN TANKMASTER will give *outstanding* service to your customers.

Write for specifications and complete information.

THE TITAN VALVE & MANUFACTURING COMPANY

9913 ELK AVENUE • CLEVELAND 8, OHIO

Keep your eye on V-P-I WHEN SELECTING BLOWERS



CENTRIFUGAL

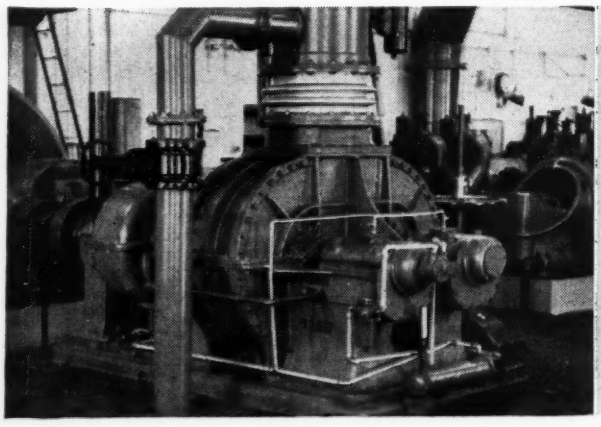
Turbine-driven Centrifugal Gas Booster in public utility, one of many R-C units used by this customer. Capacity 14,000 cfm.

You can't afford to risk shutdowns today because of unsatisfactory or inadequate equipment performance. To keep production moving at the required fast pace, calls for blowers or gas pumps that continuously deliver positive Volume at required Pressure—and at Low power costs to reduce operating expense.

You get these 3 essentials from R-C Blowers and Gas Pumps. Whether your needs call for Centrifugal or Rotary Positive units, we can match them from our exclusive *dual-ability line.* With capacities from 5 cfm to 100,000 cfm, you can usually find R-C units that closely fit your demands, with resultant savings in time, cost, space, weight and power.

From an experience of almost a century of blower building, our engineers will gladly make suggestions of the right R-C equipment to move or measure gas and air to keep production going.

ROOTS-CONNERSVILLE BLOWER CORPORATION
510 Oregon Avenue, Connersville, Indiana



ROTARY

Type RCGH Rotary Positive Gas Pump in eastern public utility plant. Capacity 6,750 cfm. This company is a large user of R-C equipment.

ROOTS-CONNERSVILLE

BLOWER BUILDERS SINCE 1854

ONE OF THE DRESSER INDUSTRIES

A series of changes has been made in the staff of United Gas Co.'s (Shreveport) legal department. W. O. CRAIN, who has served United in various legal capacities for 20 years, has been appointed general counsel, succeeding GEORGE O. FISER, named advisory attorney. At the same time E. J. FREIBERG, with the company since 1947, has been designated assistant to the general counsel to handle legal matters relating to financial phases of the companies' operations, and SAUNDERS GREGG has been named assistant to the general counsel in handling contract matters.

Recent personnel changes at Semet-Solvay Engineering Division, Allied Chemical & Dye Corp., New York, include the appointment of R. PHILLIPS OLIVEROS, former assistant manager, as manager, and LOUIS W. HERBST JR., former operating, project, and sales engineer, as assistant manager, succeeding Mr. Oliveros. Mr. Oliveros replaced the late H. B. PEARSON.

Atlanta (Ga.) Gas Light Co. has announced the complete recovery and return to active duty of ROY L. WILLBANKS, who has been appointed residential sales supervisor at Macon, Ga. He had been with the company from 1930 until he became ill several years ago . . . HAROLD REINTJES of Godfrey L. Cabot Inc., Boston, has been named special assistant to Dr. C. A. Stokes, director of Cabot's research and development department. He was also appointed vice president and general manager of Petrocarb Equipment Inc. Mr. Reintjes for the past five years has been associate director of the Illinois research and development division, Great Lakes Carbon Corp. . . .

H. N. MALLON, president of Dresser Industries, has been elected president of the Dallas Council of World Affairs. The organization was founded recently and Mr. Mallon was instrumental in its organization . . .

New advertising manager of Servel Inc., Evansville, Ind., is ROBERT M. STEVENS, who has been sales manager of the Servel New York Corp. The company also has announced the appointment of GORDON J. MALONE as eastern regional manager for Servel refrigerators, water heaters, and air conditioners . . .

HAROLD F. CARR has succeeded the late Louis J. Nevraumont as personnel manager at Pacific Gas & Electric Co., San Francisco. Mr. Carr has been associated with PG&E for 21 years.

Obituary

M. R. Thompson

MORETON REGINALD THOMPSON, 74, retired vice president of Southern Counties Gas Co. of California, Los Angeles, died on Sept. 26 at his home in Santa Monica, Calif. Mr. Thompson, a veteran of the Spanish-American war, was affiliated with Southern Counties for 30 years, until his retirement in 1941. In 1924 he served as a director of the Pacific Coast Gas Assn.

CURRENT READING

INVESTIGATION OF A PHOTOELECTRIC DEVICE for the Determination of Low Concentrations of Dust—Report of Investigations 4782, Publications Distribution Section, Bureau of Mines, 4800 Forbes St., Pitsburgh 13. This publication discusses laboratory tests on a device for determining extremely low concentrations of dust in synthesis gas, a mixture of carbon monoxide and hydrogen.

High-priority synthesis gas essential to the manufacture of synthetic liquid fuels is a major cost item in such production, and failure of dust-removing equipment to eliminate impurities may damage valuable equipment. Required to minimize this danger are a reliable and continuous method for measuring very low dust contents of purified gas, as well as a device which will instantly sound an alarm, and will, if necessary, automatically actuate the proper valve to stop the flow of contaminated gas.

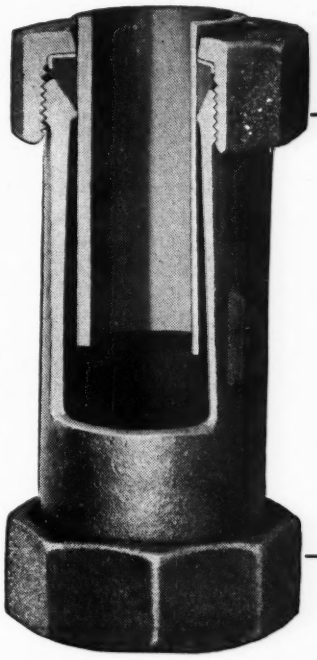
To meet these needs, an instrument company designed an instrument which compares, by means of photo-electric cells, the intensity of a light beam passing through the gas and a similar beam passing through clean air.

Results of the study showed that the instrument was satisfactory in most respects, but had a sensitivity of only 0.75 grain per 100 cu ft as compared with the maximum permissible dust concentration of 0.05 grain per 100 cu ft—about the same concentration as in average city air. Work is continuing to improve this factor, the report states.

ACCIDENT PREVENTION MANUAL FOR INDUSTRIAL OPERATIONS—Published by the National Safety Council, 425 N. Michigan Ave., Chicago, Ill. This expanded, 800-page second edition contains 256 more pages and 11 more sections than the first edition, issued four years ago. Confined principally to safety in the manufacturing industry, the book is based on the premise that a major proportion of accident causes are common to all industry. In addition to the table of contents, each section contains a list of contents. There is also an alphabetical index. Price: $9 to members of the council, $18 to others.

THE USE OF GAS RADIANT HEAT to prevent "Picking" or "Sticking" in the Application of Coatings in the Paper and Textile Industries — Issued by the American Gas Assn.'s industrial processing committee and prepared by L. R. Foote for the textiles subcommittee. Designated Information Letter No. 43, this bulletin describes one of the many applications of gas to textile or paper processing which raises production, lowers operating cost, and increases profit.

GAS FACTS, 1950 Edition—Published by the Bureau of Statistics, American Gas Assn., 420 Lexington Ave., New York 17. Among improvements incorporated in this latest statistical yearbook are composite income statements and balance sheets in dollars for the entire gas utility and pipeline industry for the period 1937-50. Data on gas sales have been stated in therms, rather than cubic feet, for easier comparison with fuels of different heat values. Cost: $1.



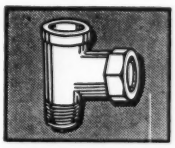
NORMAC

Couplings, Sleeves and Fittings

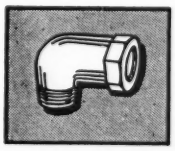
for maximum deflection, ease of "stabbing," complete confinement of the rubber!

So close are "Normac" rubbers confined at the gasket tip that possibility of flow is reduced almost to "nil." These couplings, sleeves and fittings . . . approved by gas utility men across the country for their time-saving features, ease of handling and dependable service . . . are available in a complete range of sizes. Made from air furnace malleable iron they provide greater wall thickness than pipe on which used.

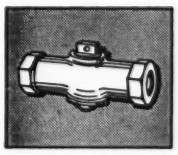
NORMAC COUPLINGS are made with 5" centers in all sizes. NORMAC SLEEVES are identical in design except that they are identical in design except that they are made with 10" centers. Nuts and gaskets are interchangeable.



Compression-End Service "Tee"—First fitting of this type ever produced with full coupling depth and special threads on male end to prevent dropping into old hand taps when used to replace standard threaded fittings.



Compression-End Service "Ell" — Extra depth makes it possible to "stab" pipe into stops and without measuring, pull back a safe distance to allow ultimate deflection eliminating possibility of strain against tap in main.



Compression-End Iron Body Brass Core Service Stopcocks—End the necessity of threading on the job plus the elimination of the threads themselves—combining all the advantages of NORMAC COUPLINGS and the best in stopcock design. 2½" coupling depth on each end.

Normac Brass Fittings Developed in 1939 for Use with Copper Tubing—Our complete line of brass fittings can be used either on new installations or where copper is run through old steel pipe in large or small openings. The center to end dimensions of NORMAC TEES correspond with old malleable iron fittings. This feature is extremely important in the use of these fittings in one foot openings where the tubing must line up with the steel which has been removed.

Write for the NORMAC CATALOG of Gas Distribution Equipment

NORTON-McMURRAY MFG. CO.

122 SOUTH MICHIGAN AVENUE - - - CHICAGO 3, ILLINOIS

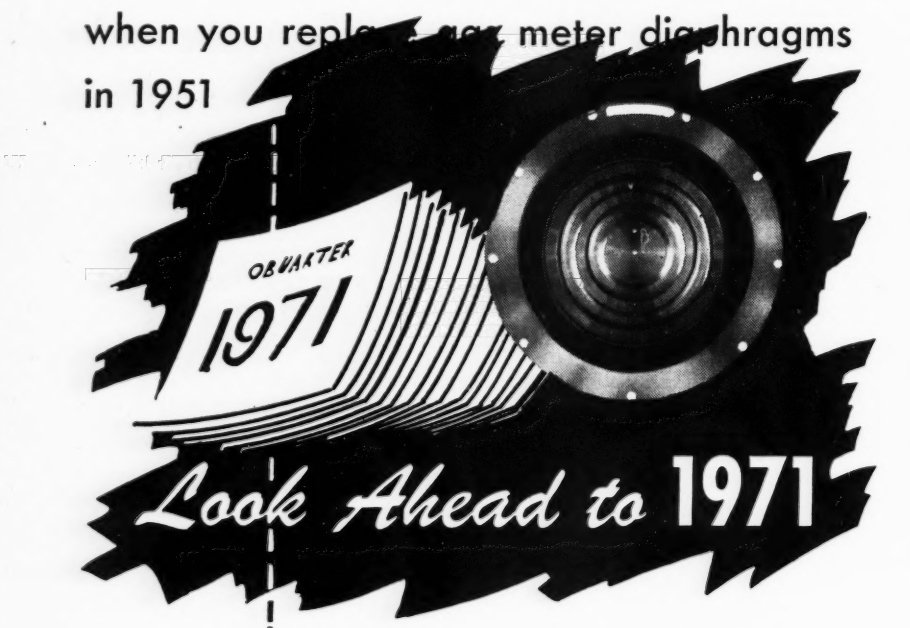
Couplings • Meter Bars • Sleeves • Cocks • Bell Joint Clamps • Service Tees & Ells

TRADE LITERATURE

DE LAVAL STEAM TURBINE CO., Trenton 2, N. J.—Bulletin No. 0500 contains 52 pages of illustrated information on multi-stage, single stage end suction, and single stage double suction centrifugal blowers and compressors. Capacities range from 1000 to 150,000 cfm for pressures to 150 psi and above, with special units for higher pressures and service at operating pressures to 1000 psig.

ABRAMS AERIAL SURVEY CORP., 606 E. Shiawassee St., Lansing 1, Mich.—"Aerial Surveys and Maps from Photographs" is a 16-page booklet presenting a brief, non-technical explanation of aerial photogrammetry. It shows products that are made from aerial photographs and ways in which aerial mapping saves time and money on engineering projects. The company will furnish copies of the booklet without charge.

LEEDS & NORTHRUP CO., 4934 Stenton Ave., Philadelphia 44 — Newly revised Catalog EH22(2) describes Wenner potentiometers for precision voltage measurements. Both the low-range instrument, used for precision measurement of thermocouple voltages, and the high-range, used for accurate voltage measurement up to 1.9111 volts, are included in this illustrated bulletin, available upon request.



It doesn't take a minute longer to put in the *Meter-Proved* Lancaster Metal Rim Diaphragm. But you can expect many more years of continuous service. Many of the Lancaster Metal Rim Diaphragms installed in 1931 are still in the meters . . . giving accurate gas measurement. Yes, service records of 15, 20 or more years of continuous service are commonplace.

METAL RIM DIAPHRAGMS

May we send you a sample and show you why Lancaster Metal Rim Gas Meter Diaphragms last longer?

Lancaster METER PARTS CO.
POST OFFICE BOX 378 LANCASTER, OHIO

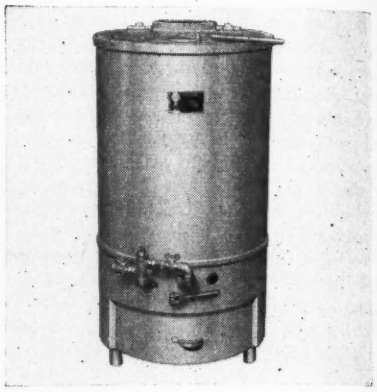
NEW PRODUCTS

Incinerator

INCINERATION DIVISION, Bowser Inc., Cairo, Ill.

MODEL: Incinor S-224.

DESCRIPTION: This automatic, heavy-duty, gas-fired incinerator has been designed to handle the disposal of wet or dry garbage and combustible refuse in stores, institutions, clinics, small apartment houses, and



multiple dwellings. It has a 4-bu capacity and is AGA approved for use with all gases.

The burner unit employs a ribbon type flame, and Btu input is 40,000. An insulated charging door is located waist-high in the cast iron top. The ash receiver is a drawer located in the base. Baked silicone base aluminum enamel is the finish on the outer casing.

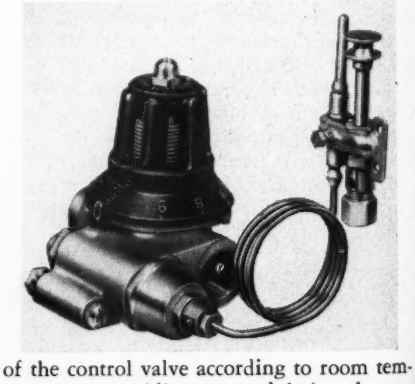
Modulating Gas Valve

MINNEAPOLIS-HONEYWELL REGULATOR CO., Minneapolis, Minn.

MODEL: V5163 thermostatic valve.

APPLICATION: Intended for installation in small homes, cabins, and cottages. It can also be used in many commercial applications, including incubator houses, brooder houses, and tobacco curing heating units.

DESCRIPTION: Developed for space heaters, this valve combines a bellows thermostat, valve, minimum flame adjustment, and safety pilot with 100% shutoff in one compact unit. The thermostat varies positioning



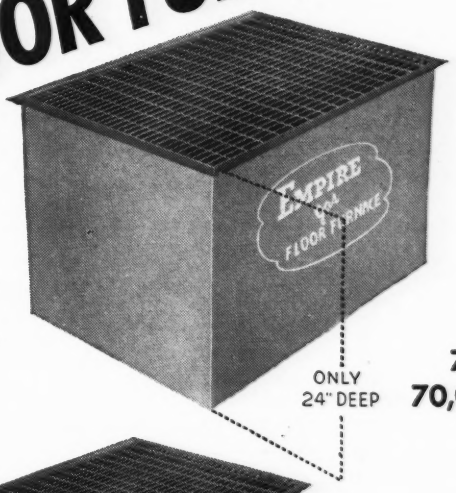
of the control valve according to room temperature, providing a modulating burner flame which ranges from full volume to a pre-set minimum. The AGA-approved device has a 100% shutoff safety pilot; an optional model, V5140, is available without safety pilot.

Zone Control

WITH

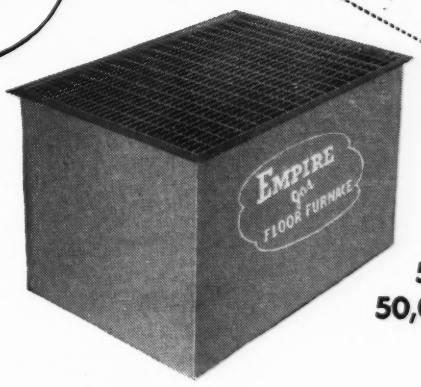
EMPIRE GAS FLOOR FURNACES

NO INTERNAL *Baffles* TO BURN OUT

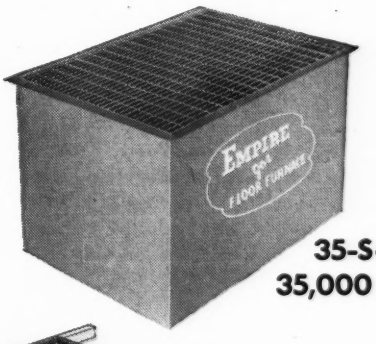


ONLY 24" DEEP

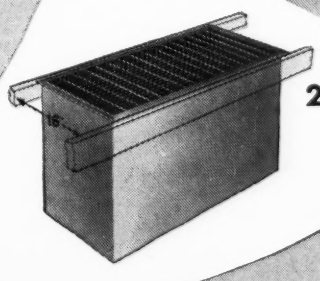
70-S-1
70,000 BTU



50-S-1
50,000 BTU



35-S-1
35,000 BTU



25-S-1
25,000 BTU

THE *Latest* IN MODERN GAS HEATING

Your customers will enjoy more comfort and lower operating costs when provided with a flexible heating system, enabling them to have different temperatures in the various sections of their homes.

An inexpensive, yet a highly satisfactory Zone Control Installation, can be accomplished by installing two or more Empire Floor Furnaces, individually controlled with Automatic Temperature Controls. Temperatures can then be controlled in the zone or section of the home in which each furnace is installed.

AGA APPROVED

EXCLUSIVE WITH EMPIRE

the FAMOUS

Gas BURNER

IT'S ENGINEERED, NOT ADAPTED FOR THE AVAILABLE GAS SUPPLY

EMPIRE STOVE CO. BELLEVILLE, ILL.

World's largest manufacturers of Floor Furnaces

Drag-shovel

BUCYRUS-ERIE CO., South Milwaukee, Wis.

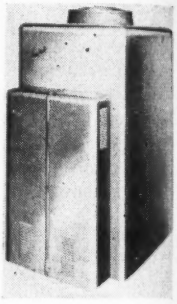
← MODEL: Hydrohoe.

DESCRIPTION: Exclusive features which make this hydraulic truck-mounted drag-shovel particularly efficient for trenching and specialized digging jobs include two separate digging actions; precision control permitting fraction-of-inch movements; hydraulic ejector on dipper; no bails, sheave blocks, or drag ropes on the bucket to interfere with loading; and rapid conversion to clamshell or crane in the field.

Force for the primary digging action is applied by a hydraulic ram located between the boom and the dipper handle. A second digging motion comes from the telescoping of the boom. The operator reportedly can dig across pipe and buried cable, in front of or behind boulders, all without moving the machine. On open highways, speeds up to 50 mph may be maintained.

A hydraulic ejector built into the dipper eliminates jerking and jarring and steps up efficiency to the 18-in. bucket and makes possible use of a 12-in. bucket. The Hydrohoe works effectively to a depth of 12 ft 6 in. over rear of truck, the manufacturer says, and has a minimum reach of 23 ft.

Gravity Furnace



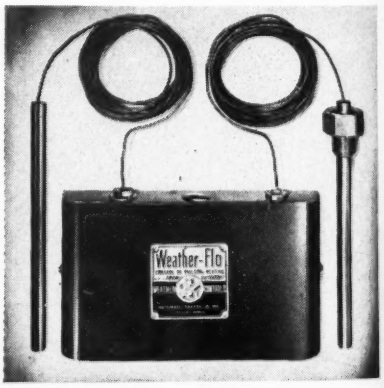
SURFACE COMBUSTION CORP., Toledo 1, Ohio.

MODEL: Janitrol GDS.

DESCRIPTION: In this 125,000-Btu unit, emphasis has been placed on faster circulation and quieter operation. Thermostat sensitivity, coupled with fast burner response, delivers heat instantaneously. Glass wool insulation in jacket saves heat and deadens sounds. Round or rectangular ductwork with an extended plenum may be used.. Exterior finish is blue hammered enamel.

Heating Control

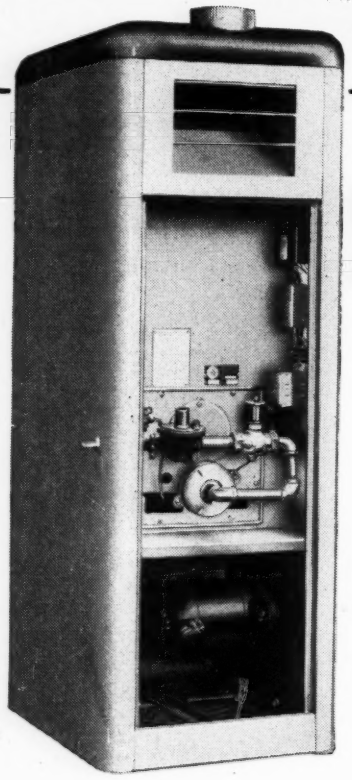
AUTOMATIC DEVICES CO. INC., Western Springs, Ill.



MODEL: Weather-Flo indoor-outdoor modulating control.

DESCRIPTION: An outdoor weather reading combined with a temperature measuring

LOW or HI-BOY...



This remarkable new

SECURITY

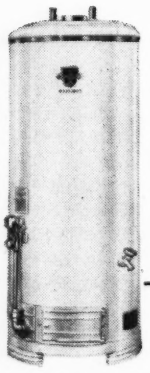
MODEL SFA FURNACE

handles any forced air problem!

Security leads the trend to compact efficiency with the new SFA Series. Adaptable to every domestic winter air conditioner situation. Versatile enough for conventional, basementless or utility room installations. Completely engineered for effortless, automatic heating. Yes, sir . . . the SFA brings greater economy and longer life to home heating!

Only Two Connections Necessary

Completely assembled at factory. Hook up just one gas and one power line! Filter racks optional at bottom, right or left. Each control can be removed without disturbing other wiring. You'll be amazed at its versatility. Available for all gases. Write or wire now for complete information, prices.



SECURITY

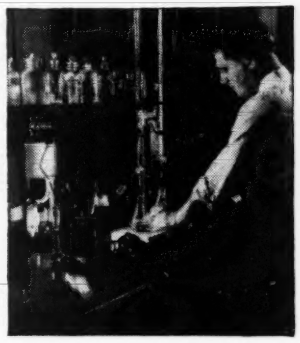
SECURITY MANUFACTURING CO.
1630 Oakland St. • Kansas City 3, Mo.

Also manufacture the famous Security Heavy Duty Water Heater and full Line of Gravity, All-Purpose, and In A Wall Furnaces and Conversion Burners.

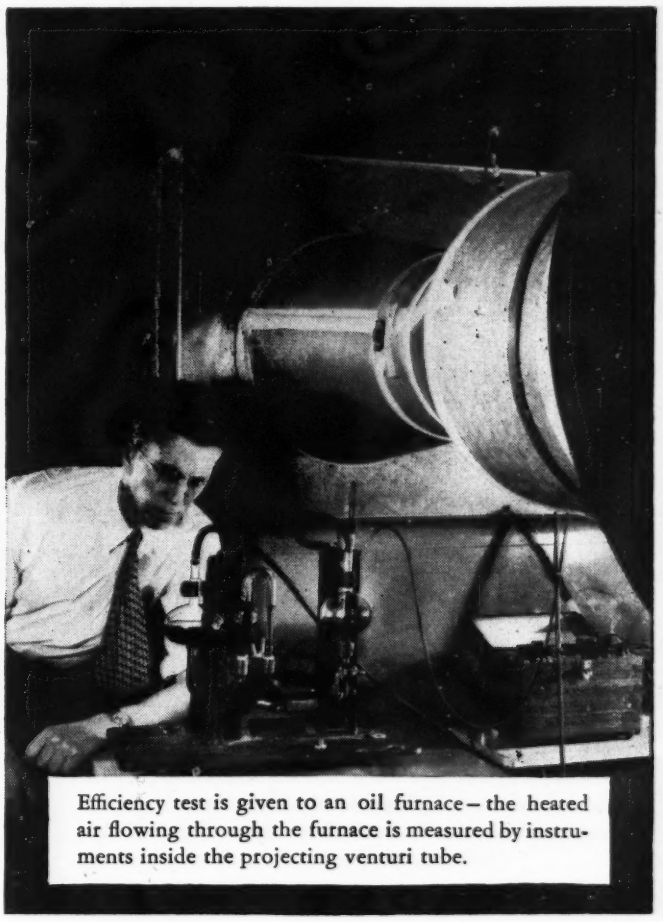
You don't want any "bugs" in a furnace!

Delco Appliance's "heat laboratory" combines scientific ingenuity and practical knowledge – to develop top quality products.

A new "counterflow" furnace is put through its paces. Its performance will be recorded by precision instruments.



Even chemistry is brought into furnace tests. Here a zinc plating solution is tested for use on many furnace parts.



Efficiency test is given to an oil furnace – the heated air flowing through the furnace is measured by instruments inside the projecting venturi tube.

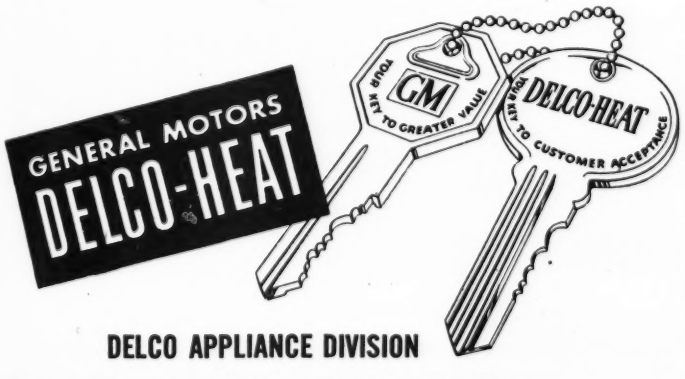
It takes plenty of new ideas to produce an outstanding new product – and the engineers at Delco Appliance certainly come up with their share! But turning these ideas into finished products involves a lot of hard work. And that's where the Delco Appliance "heat laboratory" enters the picture.

For in the heat lab, working pilot models of furnaces, boilers or burners – built from the engineers' blueprints – are put into operation and are tested, worked over and modified. They are given rough treatment, too – far more rigorous than a heating unit ever receives in a home heating system. And only when the engineers have all the "bugs" ironed out of the units will they go into assembly line production.

The real importance of all this testing and developing can be seen in every heating unit in the Delco-Heat Line. Their dependable, economical operation, their wide range of capacities, complete adaptability and easy installation have all been developed through the work of the Delco laboratory.

The unexcelled engineering features of the Delco-Heat Line – the competitive prices, and the selling assistance he gets – all enable the Delco-Heat Retail Distributor to give his customers today's top values in automatic heating. For information on a Delco-Heat franchise, send the coupon below.

YOUR KEYS TO GREATER PROFITS



DELCO APPLIANCE DIVISION
General Motors Corporation, Rochester 1, New York

DELCO APPLIANCE DIVISION, Dept. G-31
General Motors Corporation, Rochester 1, N. Y.

Please send me information about a Delco-Heat franchise.

Name.....

Firm Name.....

Street.....

City..... *Zone*..... *State*.....

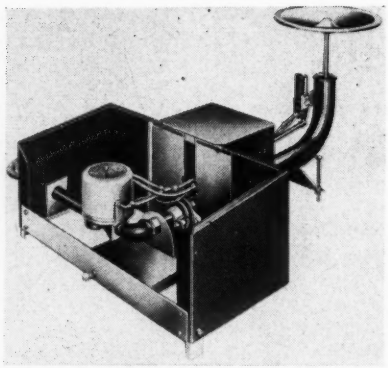
bulb in the heating system changes the rate of heat flow with weather variations. Continuous, regulated heat flow is provided by a built-in fan or switch. Heating lags caused by overshooting and underheating are said to be eliminated. The unit, designed for use with all fuels and all heating systems, may be adjusted for various design temperatures, operating temperature ranges, minimum temperatures, and heat cutoff.

Conversion Burner

INGERSOLL PRODUCTS DIVISION, Borg-Warner Corp., Kalamazoo, Mich.

MODEL: Single port, upshot type for furnaces or boilers.

DESCRIPTION: Certified by AGA for



use with all gases, this burner meets all domestic heating requirements. Input ratings ranges from 60,000 to 300,000 Btu hr. Extra orifices are supplied with each burner, and the orifice may be changed to vary input. Other features include pretested controls, detachable air tunnel, and green housing.

Portable Signal Flasher

HALEDY ELECTRONICS CO., 57 William St., New York 5.

MODEL: Electronic flasher.

DESCRIPTION: This flasher has no moving parts or filaments. The cold cathode tube de-

sign permits a sharp, brilliant flash of light visible for approximately a mile. The aluminum case measures 6 x 6½ x 10 in., weighs 8½ lbs., and is equipped with a carrying handle. The instrument uses a set of three 90-volt batteries in series. An on/off switch and an outside knob control the number of flashes per minute.

Gas Regulator

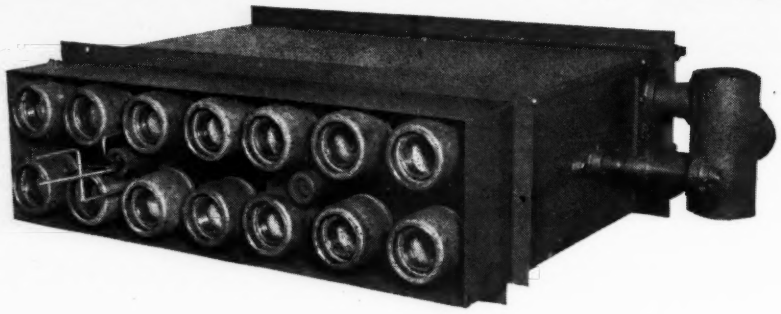
DETROIT REGULATOR CO., 1742 Rivard St., Detroit 7, Mich.

MODEL: RV-110 Maxitrol.

DESCRIPTION: This newest addition to the Maxitrol line is available in 2½ or 3-in. pipe sizes with capacities of 3,108,000 and

3,626,000 Btu, respectively, for .7 sp gr gas. Laboratory tests, the manufacturer says, show that the RV-110 will provide excellent regulation at inlet pressures above 1 psi and at flow rates in excess of AGA ratings. It is therefore adaptable to special applications on high-input commercial and industrial equipment as well as large boilers and other domestic appliances.

WEBSTER KINETIC* BURNER



FOR LOW PRESSURE GAS

Scotch Marine type boilers, air heaters and any other type of "cold" furnace can be fired by natural gas at higher ratings.

The Webster Kinetic Burner is easy to install, compact and economical to operate.

It fires with extremely low pressure gas without noise, vibration or electric power and with minimum furnace draft.

The Webster Kinetic consists of a multiplicity of full venturi mixers with flame retention nozzles. These are assembled in a metal casing complete with pilot and louvre. It may be used with natural, mixed or liquefied petroleum gases. Standby oil burners may be used when desired.

As a multiple head assembly it is available in 25 standard sizes of from 4 heads to 48 heads, and can be supplied in any size or shape. Natural gas input ratings from 560,000 Btu/hr to 6,720,000 Btu/hr at 4" wc. For complete information request Series B8 Bulletins.

*TRADEMARK

The WEBSTER ENGINEERING COMPANY

TULSA, OKLAHOMA

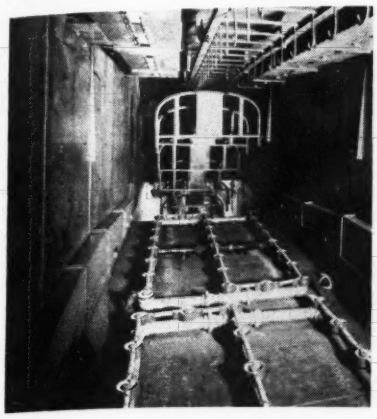
Division of SURFACE COMBUSTION CORPORATION, Toledo, Ohio

Burn-off Process

BURDETT MANUFACTURING CO., Chicago, Ill.

MODEL: Radiant-Heat burn-off process.

APPLICATION: For preparing metal parts for finishing.



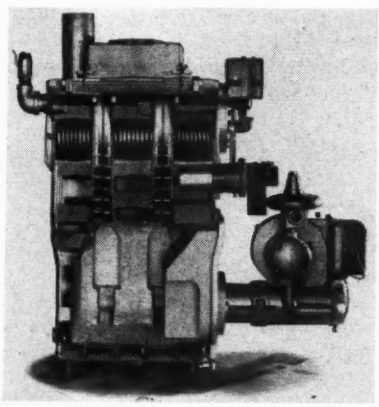
DESCRIPTION: This process, says the manufacturer, assures a product free from oil, grease, or other impurities in laps, seams, joints, corners, and bends. A heating cycle of five to eight minutes at a temperature of 650° to 675°F, using radiant heat gas burners, is said to result in a clean, dry surface which offers excellent adhesion qualities for finishing. In addition to removing surface film, the process produces a rust-inhibiting surface on metal.

Gas Boiler

BURNHAM CORP., Irvington, N. Y.

MODEL: PB series gas boiler.

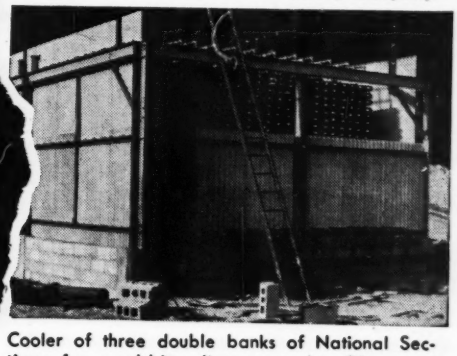
DESCRIPTION: This dual purpose unit is designed to furnish automatic heating plus satisfactory year-round hot water. All models but one are available with built-in, tankless domestic hot water heaters. Low pilot consumption, small heat loss accomplished without air dampers, tight boiler construction, and glass wool jacket insulation cut the cost of heating the water, the manufacturer says.



The quiet power burner doesn't "pop" as it goes on, it is claimed. Controlled air and gas flow give positive combustion at every stage of the burning cycle regardless of draft variations. Gas is burned in a short refractory tunnel under positive air pressure. The boilers all feature vertical flue travel over hundreds of heat absorbing fins. Push botton electric igniter and transformer relay are standard equipment on the line.

TWO BASIC COOLING PROBLEMS *solved* FOR THE LONG ISLAND LIGHTING COMPANY WITH NATIONAL CAST IRON COOLING SECTIONS

National Cast Iron Cooling Sections for compressor and engine jacket water at the Glenwood Landing Plant of Long Island Lighting Company.



Cooler of three double banks of National Sections for scrubbing liquor at the Glenwood Landing Plant of Long Island Lighting Company.

National Cooling Sections installed at the new gas conversion plant of the Long Island Lighting Company at Glenwood Landing, are (1) cooling the recirculating scrubbing liquor which cleans and cools finished gas in the reforming process, and (2) cooling the fresh water that is circulated in the jackets of gas compressors.

Over 28,000 square feet of cooling surface is provided by these National Sections built up in banks of parallel stacks of sections in series—1254 sections in the scrubbing cooler and 1280 sections in five compressor coolers.

In this plant the National Sections operate as a closed cooling system—fresh water being circulated through the sections with raw salt water from Hempstead Harbor sprayed over the section exteriors —thus prolonging the life of the equipment because corrosive salt water is not in contact with operating machinery. National Cooling Sections are made of highest grade cast iron, have high resistance to salt water corrosion and are economical both in first cost and maintenance.

The installation has proved so satisfactory that additional National Sections have been purchased by the Long Island Lighting Company for new construction.

If you have similar cooling problems or are interested further in the possibilities of National Sections, send the coupon below for detailed information.

NRC

Heat Transfer Division

THE NATIONAL RADIATOR COMPANY

JOHNSTOWN, PENNSYLVANIA

SEND COUPON TODAY!

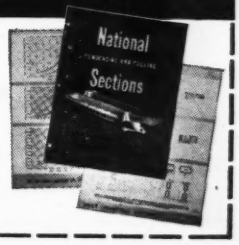
The National Radiator Co., Heat Transfer Division, G
Johnstown, Pennsylvania

Please send Technical Manual HT-20 on National Condensing and Cooling Sections.

Name_____

Firm_____

Address_____ City_____ Zone_____ State_____



ASSOCIATIONS

Reports

Rates, Federal Regulation Top INGAA Subjects

"Just the threat of regulation over transportation or sale of natural gas, or sales made in production or gathering, is creating a scarcity of this fuel for people in the North and East who are not privileged to live in the great gas-producing areas," said U. S. Sen. Robert S. Kerr of Oklahoma in his address before the annual meeting of the Independent Natural Gas Assn. of America at the Skirvin hotel, Oklahoma City, Sept. 24. In the absence of Senator Kerr the paper was read by Frank C. Love, vice president of Kerr-McGee Oil Co., Oklahoma City.

"One of the most important matters before the industry is the question of rate increases," declared Paul Kayser, president of El Paso Natural Gas Co., who was re-elected president of INGAA. He cited that FPC, between Feb. 7, 1942, and June 30, 1951, had issued 727 certificates of public convenience and necessity authorizing construction and operation of 42,384 miles of gas pipelines, with additional facilities of 2,760,343 hp, at an estimated cost of $2,841,184,334.

"This fabulous development has been based on the facts that, relative to other fuels, natural gas has been cheap and efficient for the consumer and that the investor has been assured of a fair return on his money invested in the enterprise with faith in the FPC's rule of a 6 to 6½% return," the speaker asserted. "If this rule is not maintained certainly the growth of this great industry will stop and the public will be deprived of the value of natural gas service."

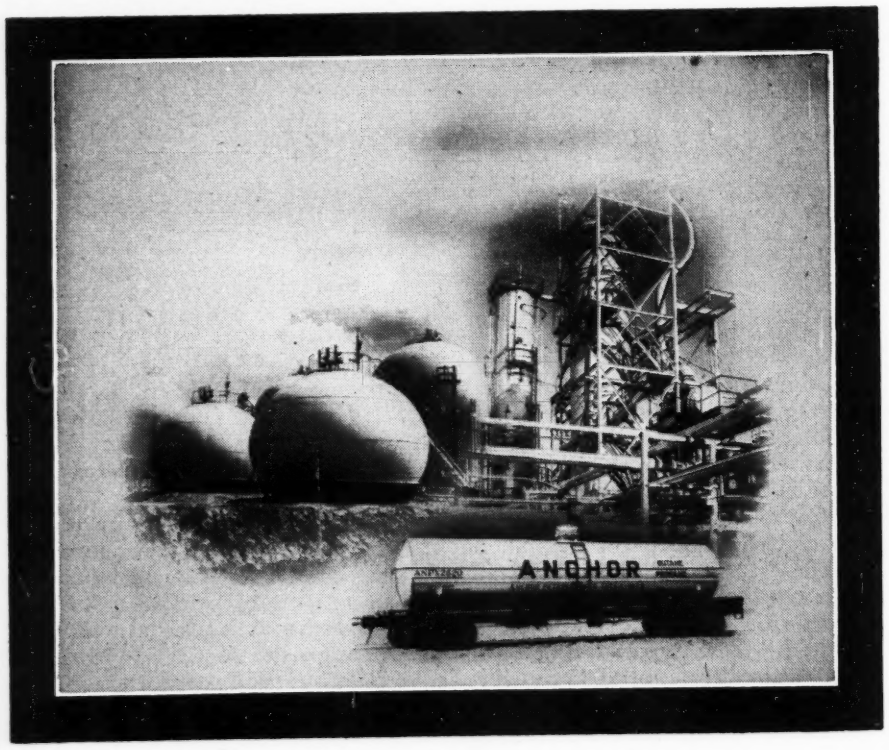
C. P. Rather, assistant deputy administrator of PAD, reported a shortage of steel for large-diameter pipe. "I think it is clear that we will not be able to cash all of our fourth quarter tickets," he said. "This is principally because the right sizes are not available. However, I think that before the quarter is over we will be successful in placing more than 462,000 tons already out as against the 489,601-ton allocation."

"The story behind the tremendous growth of the private gas companies is the story behind America's competitive system at work," declared Frank C. Hockema, vice president, Purdue University, in his address on "Private Enterprise for Public Service." The natural gas industry, one of the youngest, fastest growing, and most progressive among our industries, has used for pipelines alone nearly 100 million tons of steel. This enormous growth, during the past quarter century in particular, is due to strenuous effort, intelligent planning, and willingness to risk funds by private enterprise."

Gov. Johnston Murray, who is advocating the formation of a Tri-State Industrial Conference, commended the great progress in conservation of gas. He said the Southwest has 70% of the natural gas supply of the United States with present known gas reserves only sufficient to last 27 years. There is estimated to be a sufficient coal supply to last 2000 years, the Oklahoma governor declared. He pledged to do everything possible to "reverse the trend, keep gas from slipping away, and retain enough of it in this area to meet needs of homes and industry for an indefinite period."

Specially featured on the program was a round-table discussion of storage of natural gas led by Scott Hughes, Southern Union Gas Co., Dallas. John L. Gere, assistant chief engineer, Cities Service Gas Co., declared that the program for underground storage in depleted gas fields is popular from the viewpoint of management of pipeline companies, distributors, and persons in areas conscious of natural gas service. It serves a purpose of sound economics and insures a supply of natural gas to meet market demands. J. J. Hedrick, president, Natural Gas Pipeline Co. of America, Texas Illinois Natural Gas Pipe Line Co., and Natural Gas Storage Co. of Illinois, discussed the Herscher gas storage project of Illinois. Tests have indicated, he asserted, that it will ultimately develop an effective underground storage in excess of 90 billion cu ft.

Discussing the storage of gas in underground water sands, Dr. Ionel I. Gardescu, vice president, Transcontinental Gas Pipe Line Corp., Houston, declared that in spite of the failures of such projects in a 1500-ft water sand in the New Harmony field of Illinois in 1942, and storage of gas in a



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6600-ft water sand in the Hastings field of Texas in 1947-48, "storage of gas in water sands can and will be successfully used in many cases where suitable geologic structures can be located in the vicinity of large natural gas consuming markets and where depleted oil and gas reservoirs are not available."

In addition to the re-election of Paul Kayser as president, other INGAA officers for the coming year include J. F. Merriam, Northern Natural Gas Co., first vice president; S. B. Irelan, Cities Service Gas Co., second vice president; F. W. Peters, Oklahoma Natural Gas Co., re-elected treasurer; John A. Ferguson, Washington, D. C., re-elected executive director; and W. E. Disney, Tulsa, re-elected general counsel.

New directors are Clyde H. Alexander, Dallas; J. F. Merriam; B. A. Hardy and Harry L. Mann, Shreveport; W. G. Skelly, Tulsa; S. B. Irelan; A. M. Rippel, Bartlesville; Henry Fink, Detroit; and William G. Marbury, St. Louis.

OUA Delegates Told Dealer Education Vital

Natural gas appliance sales offer larger net profits for dealers who push them and better overall satisfaction to customers than those of competing fuels, Dean A. Strickland, general sales manager, United Gas Corp., Houston, told members of the Gas Division, Oklahoma Utilities Assn. at their annual meeting held at the Biltmore hotel, Oklahoma City, Sept. 21.

"Competition from electricity isn't serious yet, but too many dealers display gas ranges in the backs of their stores and push electric ranges up front," Mr. Strickland said. He urged gasmen to be alive to the importance of informing dealers on the advantages of gas ranges and other modern gas appliances. The speaker reminded his hearers that two out of three gas users have obsolete gas ranges—meaning pre-war models.

H. C. Webb, general sales manager for Oklahoma Natural Gas Co., Tulsa, speaking on, "This Business of Ours," called attention to the tremendous growth of the natural gas industry with its more than 350,000 miles of gas mains. He urged greater efforts on the part of employees to get the gas story over to customers, while fulfilling their responsibility to customers, stockholders, and the public.

The three little words, "Rise, Give, and Get" were the theme of the address of W. L. Woodward, president, Zenith Gas System Inc., Alva, Okla. He stressed the importance of his company's service department in creating and maintaining good public relations.

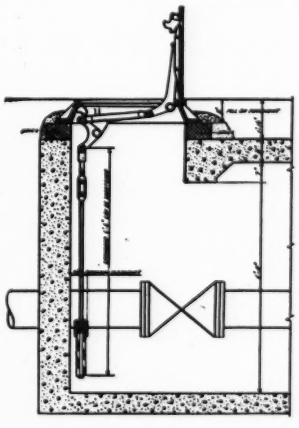
Other speakers included D. J. Williams, assistant to Special Agent D. A. Bryce, FBI, Oklahoma City; J. Wilson Swan, Braniff Investment Co., Oklahoma City; and J. Y. Wheeler, Ardmore, special representative, Lone Star Gas Co. In the afternoon an inspection trip was made through Oklahoma Natural's new service center in Oklahoma City.

Vernon F. Stanton (left), president-elect of the New Jersey Gas Assn., receives the gavel from Robert H. Philipps Jr., outgoing president.

New Jersey Officers Named

Officers selected by the New Jersey Gas Assn. at its annual meeting Sept. 7 are headed by Vernon F. Stanton, South Jersey Gas Co., president; Elmer A. Smith, Public Service Electric & Gas Co., 1st vice president; Henry Rohrs, Elizabethtown Consolidated Gas Co., 2nd vice president; and W. D. Williams, Public Service, secretary-treasurer.

Three-year directors include D. B. Otto, County Gas Co.; L. I. Pollitt Jr., Jersey Central Power & Light; H. P. J. Steinmetz and G. B. Webber, Public Service; and Robert W. Kean Jr., Elizabethtown. E. J. Ingram, Jersey Central, is a two-year director, and William A. Gemmel, South Jersey, will serve for one year.



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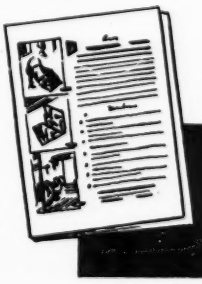

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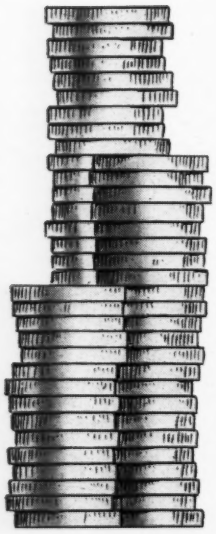

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OMAHA, NEBRASKA

CALENDAR

NOVEMBER

American Petroleum Institute Annual Meeting—Stevens hotel, Chicago, Nov. 5-8.

Mid-Southeastern Gas Assn.—Sir Walter hotel, Raleigh, N.C., Nov. 8-9.

Wisconsin Utilities Assn. Technical and Sales Convention—Schroeder hotel, Milwaukee, Nov. 14-16.

American Society of Mechanical Engineers—Chalfonte - Haddon Hall, Atlantic City, Nov. 25-30.

DECEMBER

American Society of Refrigerating Engineers Annual Meeting — Hotel Roosevelt, New Orleans, Dec. 2-5.

Institute of Cooking and Heating Appliance Manufacturers Semi-Annual Meeting—Cincinnati, Dec. 3-5.

National Warm Air Heating & Air Conditioning Assn. Annual Meeting—Hotel Cleveland, Cleveland, Ohio, Dec. 5-6.

JANUARY

AGA Home Service Workshop — Drake hotel, Chicago, Jan. 21-23.

American Society of Heating & Ventilating Engineers—St. Louis, Jan. 28-30.

MARCH

National Assn. of Corrosion Engineers—Galveston, week of March 10.

Oklahoma Utilities Assn.—Biltmore hotel, Oklahoma City, March 27-28.

New England Gas Assn. — Hotel Statler, Boston, March 27-28.

Mid-West Gas Assn. Annual Meeting—Hotel Radisson, Minneapolis, March 31-April 2.

APRIL

Florida-Georgia Gas Assn. Annual Convention—Soreno hotel, St. Petersburg, Fla., April 3-5.

Maryland Utilities Assn. Annual Convention—Lord Baltimore hotel, Baltimore, April 4.

National Conference of Electric and Gas Utility Accountants—Hotel Commodore, New York, April 7-9.

AGA Distribution, Motor Vehicles, and Corrosion Conference — Benjamin Franklin hotel, Philadelphia, April 7-10.

Southwestern Gas Measurement Short Course — University of Oklahoma, Norman, April 8-10.

Southern Gas Assn. Annual Convention—Galveston, April 28-30.

Mid-West Regional Gas Sales Conference—Edgewater Beach hotel, Chicago, April 28-30.

MAY

AGA Commercial Gas School — Chicago, May 5-9.

National Restaurant Exposition — Navy Pier, Chicago, May 5-9.

Public Utilities Advertising Assn.—Hotel Radisson, Minneapolis, May 8-9.

AGA Natural Gas Department Spring Meeting—Biltmore hotel, Los Angeles, May 12-13.

Pennsylvania Gas Assn.—Wernersville, Pa., May 13-15.

Gas Appliance Manufacturers Assn. Annual Meeting — The Broadmoor, Colorado Springs, May 21-23.

AGA Production and Chemical Conference—Hotel New Yorker, New York, May 26-28.

JUNE

Canadian Gas Assn.—Chateau Frontenac Quebec City, Quebec, June 8-12.

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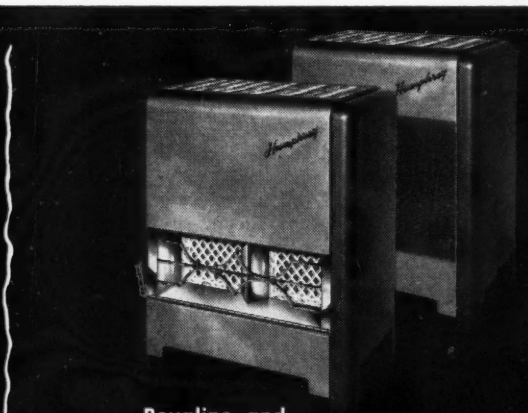

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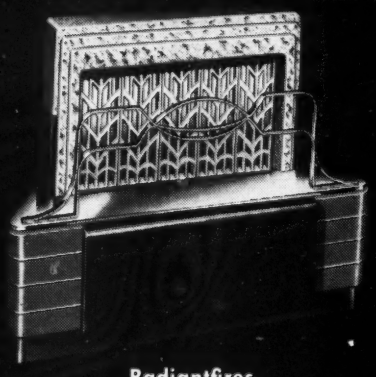
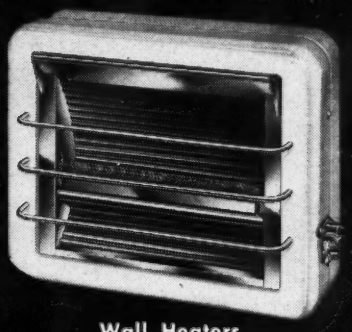


Radiantfires



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AGA-Sponsored Safety Conference Draws 150

Some 150 safety executives representing gas utility and appliance companies in the U. S., Canada, and Mexico attended the second annual safety conference sponsored by the AGA accident prevention committee. The meeting was held Sept. 17-18 at Hotel Phillips, Kansas City, Mo.

W. H. Adams, chairman of the AGA committee, presided, and B. C. Adams, president of Gas Service Co., the host company, welcomed the delegates.

That human failure is the underlying cause of the majority of accidents was the consensus expressed by such speakers as Dr. Amos E. Neyhart, Pennsylvania State College; Dwight S. Sargent, Consolidated Edison Co. of New York; R. L. Matheson, Panhandle Eastern Pipe Line Co.; and W. A. Johnson Jr., Texas Gas Transmission Corp.

At a general luncheon, T. J. Strickler, vice president in charge of operations, Gas Service Co., presented awards to 84 utilities which had improved their accident records 25% or more.

GAMA Officers Installed

At a special St. Louis meeting of GAMA's board of directors, held Oct. 14, the officers elected at the association's annual meeting last April took over their new posts. Frederic O. Hess was succeeded as president by Louis Ruthenburg, Servel Inc.; A. B. Ritzenthaler, Tappan Stove Co., moved to first vice president; and J. F. Donnelly, A. O. Smith Corp., became second vice president. Lyle C. Harvey, treasurer, and H. Leigh Whitelaw, secretary and managing director, retain those posts.

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Anniversaries Celebrated

In celebration of the 164th anniversary of the signing of the Constitution and the 8th anniversary of the founding of the Rocky Mountain Gas Assn., a joint banquet was held on Sept. 17, Constitution Day, by the association and the Sons of the American Revolution.

S. J. Neely, president of the Rocky Mountain Gas Assn., presided at the event which was held at Denver's Shirley-Savoy hotel. D. A. Bell and G. M. Musick, vice presidents of the association, also participated in the program.

Operating Men Compete

East Texas Natural Gasoline Men's Club joined Natural Gasoline Assn. of America in sponsoring its southern regional meeting in Tyler, Texas, Oct. 19. Feature of the gathering was an operating kinks session in which operating men competed with one another on ideas for doing any job in a better, safer, or cheaper way. Prize winners were automatically entered in the contest to be held at the annual NGAA convention in Houston next spring.

Speakers included John F. Lynch, La Gloria Corp., Corpus Christi; Charles Holms, Stanolind Oil & Gas Co., Tulsa; H. H. Holms, Refinery Supply Co., Tulsa; Roy H. Horton, Humble Oil & Refining Co., Houston; and Harold Legatski and Wallace Williams, Phillips Petroleum Co., Bartlesville.

Windfohr Heads Texans

Robert W. Windfohr, independent Fort Worth oil producer, was elected president of the Texas Mid-Continent Oil & Gas Assn. at the organization's 32nd annual convention held in Beaumont Oct. 8. Long active in the industry, Mr. Windfohr was a member of the original committee of 55 Texas oilmen who championed the state conservation laws during the '30s.

This Month

API Chicago Meet to Hear Chapman and Bradley

When the 31st annual meeting of the American Petroleum Institute gets under way in Chicago, Nov. 5 to 8, the list of speakers will include Oscar L. Chapman, Secretary of the Interior and petroleum administrator for defense, and Gen. Omar N. Bradley, chairman of the joint chiefs of staff.

General headquarters and meeting place for general, group, and committee sessions will be the Stevens hotel. The division of transportation sessions will be held at the Palmer House. W. Alton Jones, chairman of the API board and president of Cities Service Co., New York, will preside at both general sessions.

Other speakers include Gov. Allan Shiver

Frank Porter
. . . API prexy

Oscar Chapman
. . . PADman

of Texas and Frank M. Porter, API president and the 1950 recipient of the institute's gold medal for distinguished achievement. Special features of the program will be sessions on fundamental research and protection of petroleum facilities. More than 100 committee meetings will be held during the convention.

Wisconsin Utilities Assn. Plans Varied Program

Proposed changes in gas heating standards, use of leak detectors, chimney linings, oil gas production, and pressure elevation procedures are topics scheduled for discussion by the gas technical division of the Wisconsin Utilities Assn. The group's annual convention will be held Nov. 14-16 at the Schroeder hotel in Milwaukee.

Frank Colbert and William O'Donnell, respective chairmen of the production and distribution committees, have announced round table conferences on cathodic protection, main conditioning for leak control, holder maintenance, automatic loading and boosting type regulators.

In addition, diaphragm meters, effects of natural gas, need for accelerated repairs, customer complaints, use of mobile communication systems, and necessity of using ground connections are subjects on the program of the meter and service regulator and customer premises service committees, chairmanned by Robert Danforth and V. J. Schiebel.

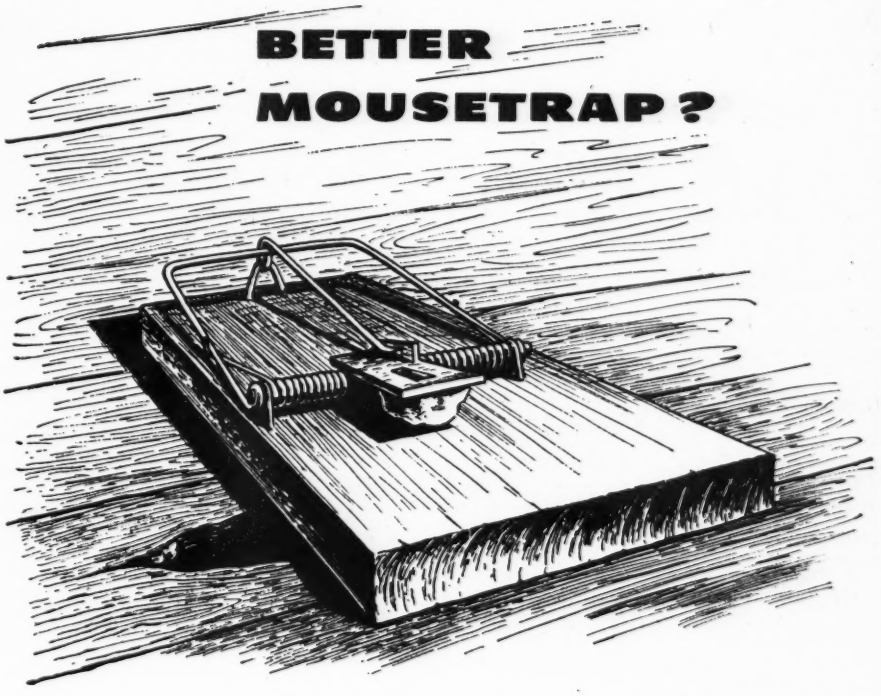
ASHVE Plans Lab Opening

On Nov. 1 and 2 the American Society of Heating and Ventilating Engineers will hold a two-day inauguration ceremony dedicating its new Cleveland Environment laboratory, a facility for research and development of data for the design and installation of panel heating and cooling systems.

"The Environment of Our Industry" is the title of an address by Cloud Wampler, Carrier Corp., to be given at a luncheon for society officers, committee members and industrial executives at the Statler hotel. It will be followed by a tour of the new laboratory. On the second day, a morning session will be held at the Statler, and a laboratory tour for the general ASHVE membership will be conducted.

Meeting Date Switched

The Panhandle-Plains regional meeting of Natural Gasoline Assn. of America will be held Nov. 20 at the Herring hotel, Amarillo, Texas, instead of Dec. 7 as originally scheduled. John Kindle, Lone Star Producing Co., Dallas, who is chairman of the program committee, made the announcement.



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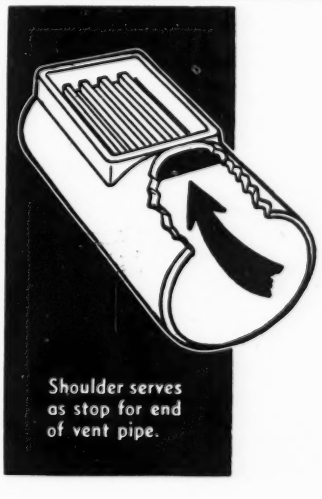

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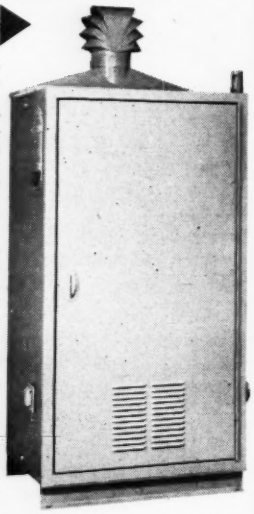

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MAKING THE GAS INDUSTRY SAFER

Among speakers at the Sept. 24 INGAA meeting were (left to right) J. J. Hedrick, Natural Gas Pipeline Co. of America; Dr. I. I. Gardescu, Transcontinental Gas Pipe Line Corp.; Scott Hughes, Southern Union Gas Co.; C. P. Rather, PAD; and John Gere, Cities Service Gas Co.

INGAA officers elected at the annual meeting are (left to right) S. B. Irelan, second vice president; Paul Kayser, president; J. F. Merriam, first vice president; and F. W. Peters, treasurer.

Shown at the head table at OUA's Gas Division meeting are (left to right) Earl J. Newlin, State Fuel Supply Co.; E. Maurice Myers, Consolidated Gas Utilities Corp.; J. Wilson Swan, Braniff Investment Co.; Lauren Clegg, Consolidated Gas; J. Y. Wheeler, Lone Star Gas Co.; Richard W. Camp, Consolidated Gas; Dean A. Strickland, United Gas Corp., and W. L. Woodward, Zenith Gas System Inc.

NEWS

Financial

Commissions Report More Rate Increases Requested

Upward rate revisions were still keeping various regulatory commissions busy last month.

In Hawaii, Arthur B. Allyne, assistant general manager of Honolulu Gas Co. Ltd., announced approval by the public utilities commission of an increase, effective Oct. 1, which is estimated to up annual revenues by $366,000. General service and refrigeration rates are increased about $400,000 a year by elimination of the discount clause in the schedule, and the industrial and large commercial schedule has been replaced by two new ones which will result in an annual reduction of about $38,000.

FPC, meanwhile, denied a petition by Hope Natural Gas Co., Clarksburg, W. Va., for rehearing of an Aug. 10 order which approved an increase in wholesale rates. Hope wanted the effective date switched from April 1950 to November 1949.

A rate increase amounting to $3,771,000 per year for wholesale service from Michigan-Wisconsin Pipe Line Co., Detroit, went into effect Oct. 1 upon posting of a $400,000 bond with the FPC. Last April 25 the commission had suspended the increase, which affects 16 utility customers in Michigan, Wisconsin, Iowa, and Missouri.

A proposed 12% rise, requested by Southern Counties Gas Co., Los Angeles, for wholesale service to San Diego Gas & Electric Co., was suspended by the commission, as was a 15% increase applied for by Atlantic Seaboard Corp. and Virginia Gas Transmission Corp., both of Charleston, W. Va.

On Oct. 31 and Nov. 2, FPC hearings were to get under way on two increase proposals by El Paso Natural Gas Co., Southern Counties' supplier. One was concerned with a $2,465,000 hike on service to the Los Angeles utilities, now in effect under bond, and the other involved an annual $7.1 million increase which would affect 26 utility customers in four states.

Increased rates filed with FPC by Virginia Gas Transmission Corp. have resulted in the filing of an application for higher rates by Commonwealth Natural Gas Corp., Richmond, Va., a Virginia Gas customer. The proposed $267,000 annually would be borne by five wholesale utility customers in Virginia.

Carolina Natural Would Serve Piedmont Properties

Carolina Natural Gas Corp., organized under Delaware laws but with its principal office in Charlotte, N. C., has moved to Raleigh to acquire, construct, and operate gas distribution systems in Hickory, Newton, Conover, Granite Falls, Lenoir, Lincolnton, and Maiden.

A petition filed with the North Carolina Utilities Commission asked for a certificate authorizing acquisition of the systems from Piedmont Gas Co., a North Carolina corporation.

Last June, Carolina Natural received FPC permission to build and operate a system of pipelines to take natural from Transcontinental Gas Pipe Line Corp. to Lexington, Thomasville, and the above cities except Maiden, and to offer direct service to certain industrial consumers. Transco has been ordered to deliver 3235 Mcf daily to Carolina.

New England Electric Sells Massachusetts Gas Holdings

All gas properties owned by New England Electric System, Boston, have been sold to New York bankers, headed by Lehman Bros. and Bear, Stearns & Co., for $22,780,000, subject to approval of the SEC and the Massachusetts Public Utilities Commission.

The companies involved, which will probably be merged into a new firm, are Arlington Gas Light, Athol Gas, Blackstone Gas, Central Massachusetts Gas, Gloucester Gas Light, Malden & Melrose Gas Light, Northampton Gas Light, Norwood Gas, Salem Gas Light, and Wachusett Gas.

Also included were the gas properties and inventories owned by Beverly Gas & Electric, Lawrence Gas & Electric, Northern Berkshire Gas, and Suburban Gas & Electric.

Portland Plan Approved

After turning down several plans for recapitalization of Portland (Ore.) Gas & Coke Co. earlier this year, the SEC has approved an amended proposal and applied to the U. S. District Court in Portland for its approval and enforcement. Hearing has been set for Nov. 12.

Under the new plan, preferred stockholders would get 90% of the reorganized company's new common stock, the rest going to American Power & Light Co., holder of all present outstanding common stock.

Newsnotes

Sale of the Cody and Meeteetse properties of Rocky Mountain Gas Co., Casper, Wyo., to Cody (Wyo.) Gas Co. has been approved by the Wyoming Public Service Commission. The transaction will bring an end to Rocky Mountain's retail natural gas operations. Purchase price of $260,000 has been set.

Refunds which some 2600 gas users in Kansas City, Mo., failed to claim since 1948 have gone into the city's general operating fund. A check for $91,509.69 was awarded to the city by the 10th U. S. Circuit Court of Appeals in final settlement of the old gas rate case in which Cities Service Gas Co. was ordered to reduce its rates.

Negotiations were in progress last month concerning the possible merger of Arizona Edison Co. Inc., Douglas, and Central Arizona Light & Power Co., Phoenix. Basis was expected to be about 1¾ shares of Calapco common stock for one share of Arizona Edison common.

Pardon Me!
but -
YOUR GAS LEAKS ARE SHOWING ...in several places

SHOWING RED in your profit and loss statement or on your Balance Sheet

SHOWING as HAZARDS for your claim dept.

SHOWING as STUMBLING BLOCKS for overloaded distribution and maintenance depts.

But - your leaks show up BEST to a HEATH ENGINEER who will locate and classify them at a minimum cost.

DON'T DELAY - don't waste a day! Have a

HEATH
GAS LEAK LOCATION SURVEY

Milton W. Heath

WRITE
WIRE OR PHONE

HEATH
TREE SERVICE INC.
WELLESLEY, MASS. RICHMOND, MICH.

"You Can't Sell Gas That Leaked Out"

Selling Refrigerators in Birmingham

Utility Helps, Competes With Dealers

The gas refrigeration sales program of Alabama Gas Corp., Birmingham, is regarded as one of the most progressive and productive in the South. Perhaps the utility's sensible dealer relations procedure is the most important factor in making it go.

Alabama Gas both assists and competes directly with its dealers. Its competitive activities are kept on a fair and completely equitable basis. The whole program has only a single-minded aim: to get more refrigerators on the company's lines.

In order to achieve this aim, the company cooperates in adhering to the locally prevailing trade-in prices, carries paper for its dealers, boosts its dealers in its advertising, and maintains a standing offer to install any refrigerator sold by any of its dealers at no cost to them.

But at the same time it does a real selling job on its own, evidence of which is the nine-week sales campaign for its salesmen, with an expense-paid trip for two to Havana, Cuba as the top prize.

Although the company in recent months yielded its distributorship to Cruse-Crawford Distributing Co., which has a statewide organization, Alabama Gas Corp. has lost no ground in its efforts to work directly with its dealers. Its dealer assistance department assures this.

J. H. Chenery, general sales manager, believes the spirit of the dealer assistance program stems from the policy that is kept uppermost in the minds of the utility's salesmen and the dealers as well: that Alabama Gas believes in the dealer program and will support it on all promotions and all sales items, and will back this up with manpower.

The dealer assistance department makes calls on dealers, giving all assistance the company feels will aid them in doing a better job. The utility fulfills wherever possible the dealer's request for specific assistance. At the same time, the company's own salesmen get an even break with "the competition."

The company believes that the only deviations from a generally recognized fair trade-in price are those made by the dealers on occasion. It's own trade-in price cutting during the recent campaign was about 10%.

Prospects uncovered by the company's residential salesmen are not referred to a dealer as an established practice. Those developed by the dealer assistance department are, however, as are lists derived from cooking schools or other demonstrations.

All advertisements under Alabama Gas Corp.'s name include a statement that identical service is to be had regardless of whether purchase of an appliance is made from the utility or one of the 500 cooperating dealers.

Dealer paper is bought by the utility without discount, but with recourse. This feature has not been accepted by the majority of the dealers, but those who have used it are "enthusiastic," according to Mr. Chenery.

One of the most important features from the utility's standpoint is the free installation offer. Through it, Alabama Gas controls the quality of the installation, assures customer satisfaction, eliminates service calls necessitated by poor jobs. Says Mr. Chenery: "We feel that a great deal of money and effort have been expended in getting people to accept gas refrigeration and to have it given a bad name simply because of poor installation procedures is grossly wasteful of that money and that energy."

Alabama Gas refuses to place all its eggs in the new home basket. Its efforts at replacing electric boxes have brought in sales that are estimated at well over 50%—perhaps two-thirds—of its total volume.

You REALLY LIVE at an

Affiliated National Hotel

Comfortable Rooms

Delicious Meals

Conveniently Located in 21 Prominent Cities

Superb Service

AFFILIATED NATIONAL HOTELS

ALABAMA
HOTEL ADMIRAL SEMMES.....Mobile
HOTEL THOMAS JEFFERSON..Birmingham

DISTRICT OF COLUMBIA
HOTEL WASHINGTON.....Washington

INDIANA
HOTEL CLAYPOOL.....Indianapolis

LOUISIANA
JUNG HOTEL.....New Orleans
HOTEL DESOTO.....New Orleans

NEBRASKA
HOTEL PAXTON.....Omaha

NEW MEXICO
HOTEL CLOVIS.....Clovis

OKLAHOMA
HOTEL ALDRIDGE.....Wewoka

SOUTH CAROLINA
HOTEL WADE HAMPTON.....Columbia

TEXAS
HOTEL STEPHEN F. AUSTIN.....Austin
HOTEL EDSON.....Beaumont
HOTEL BROWNWOOD.....Brownwood
HOTEL BAKER.....Dallas
HOTEL TRAVIS.....Dallas
HOTEL CORTEZ.....El Paso
HOTEL BUCCANEER.....Galveston
HOTEL GALVEZ.....Galveston
HOTEL JEAN LAFITTE.....Galveston
CORONADO COURTS.....Galveston
MIRAMAR COURT.....Galveston
HOTEL CAVALIER.....Galveston
HOTEL PLAZA.....Laredo
HOTEL LUBBOCK.....Lubbock
HOTEL FALLS.....Marlin
HOTEL CACTUS.....San Angelo
HOTEL MENGER.....San Antonio
ANGELES COURTS.....San Antonio

VIRGINIA
HOTEL MOUNTAIN LAKE..Mountain Lake
HOTEL MONTICELLO.....Norfolk

WASHINGTON
Washington, D. C.

BAKER
Dallas, Tex.

Regulation

Rehearing of Phillips Order Denied by FPC

Five applications for rehearing of the FPC opinion and order of Aug. 22, in which it found that it does not have jurisdiction over Phillips Petroleum Co. under the Natural Gas Act, were denied by the commission in late September.

Said FPC: "No facts and no principles of law have been presented . . . which either were not fully considered by the commission before it entered such opinion and order, or, having now been considered, justify a reversal or modification of the commission's opinion and order."

Applications had been filed by the cities of Kansas City, Mo., Milwaukee, and Detroit; the state of Wisconsin; county of Wayne, Mich.; and the public service commission of Wisconsin.

1st Quarter Allotments Set

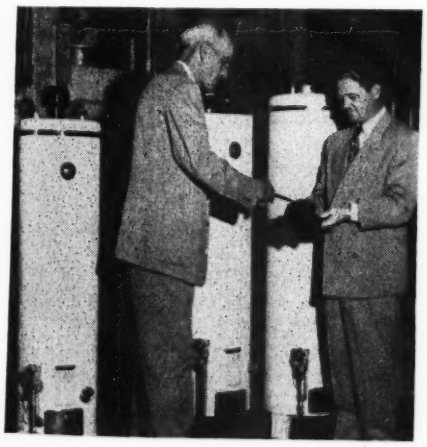
First quarter 1952 allotments of steel, copper, and aluminum have been announced by Manly Fleischmann, defense production administrator. PAD's share is to be 1,708,500 tons of steel, 8,300,000 lbs of copper and copper base alloys, and 850,000 lbs of aluminum.

Consumer durable goods have been allowed 870,260 tons of steel, 38,220,000 lbs of copper, and 49 million lbs of aluminum. "To the extent possible," Mr. Fleischmann said, "steel has been provided for the manufacture of consumer durable goods in the first quarter of 1952 to compensate, in part, for the reduced amounts of copper and aluminum that are available to these manufacturers."

Mon Wallgren Resigns Post

Effective Oct. 1, Mon C. Wallgren resigned as chairman of the Federal Power Commission, a move which had been expected for some time.

It has been rumored that Mr. Wallgren, formerly governor of Washington and a senator from that state, will return there to run for public office again.



EXECUTIVES of Dearborn Stove Co., Dallas, inspect automatic gas water heaters, part of a new line which includes 20-, 30-, 40-, and 50-gal. models. R. H. Norris, left, is executive vice president, and C. H. Hinds is director of sales.

Peerless

SINCE 1884 . . . 67 YEARS

THE NATION'S FASTEST-SELLING GAS CIRCULATORS

The Peerless line of circulators is pre-eminently the Nation's first choice. For you, that means, greater volume . . . more profits . . . and better satisfied customers. Peerless' modern styling and eye appealing beauty combined with top quality and latest engineering advancements represent the ultimate in heating value.

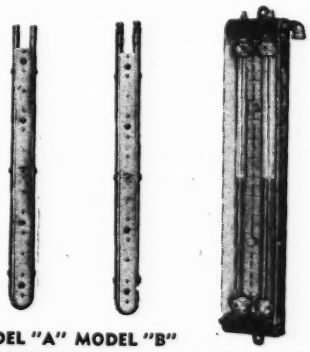
A.G.A. approved for all gases including L.P.

★Made to Sell ★Made to Last ★Made to Satisfy

PEERLESS MANUFACTURING CORP.
LOUISVILLE 10, KY.

NORWALK MANOMETERS

For Water, Mercury, Oil or Glycerine



MODEL "A" SERVICE TYPE Ideal for Serviceman's Kit

MODEL "B" HEAVY DUTY TYPE

MADE IN ALL SIZES and TYPES

For pressure or vacuum use. Service Type has unbreakable tubing and will stand abuse. Send for bulletin 3100M for complete data and prices.

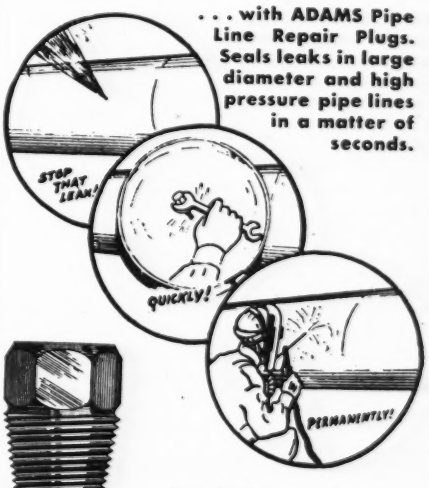
NORWALK VALVE COMPANY
South Norwalk, Conn.

Manufacturers of
NORWALK-CONNELLY REGULATORS
Since 1878

STOP LEAKS

Quickly! Permanently!

. . . with ADAMS Pipe Line Repair Plugs. Seals leaks in large diameter and high pressure pipe lines in a matter of seconds.



Installed by screwing into hole and welding.

Write for literature.

Adams
PIPE LINE REPAIR PLUGS

STAUFFER MFG. CO.
2453 Merced Avenue • El Monte, Calif.

Robertshaw-Fulton Controls Co., Lynwood, Calif. invited some 40 gas industry executives to preview its new west coast research and development laboratory in Los Angeles on Oct. 3.

Shown at the buffet luncheon, in the photograph above, are H. W. Geyer, director of the laboratory (standing at left), and T. T. Arden, executive vice president, Grayson Controls Division (standing at right). From 3 to 7 p.m. an open house was held in the laboratory.

The new building covers a 12,500-sq ft area and has a section primarily equipped and arranged to test gas ranges and their accessories. Individual cubicles have independently regulated gas supplies and permanently mounted manometers. Piping is arranged so that a test meter may be cut in at any time without interrupting a given test. In addition, the building contains two "life test" rooms.

Robertshaw-Fulton has also announced the addition of 50,930 sq ft to its Robertshaw Thermostat Division in Youngwood, Pa. Included are a second floor and wing in the engineering building, a structure for manufacture of fuse boosters, a thermostat repair building, and an extension to the Unitrol building.

Sales and Promotion

Detroit Range Sales Jump With "Operation Jambuster"

Detroit-Michigan Stove Co., Detroit, is pushing "Operation Jambuster" on a national scale. When appliance sales reached a mid-summer slump several months ago, the company decided to do something about it. A promotion plan designed to bring customers into dealer stores to see the range and to learn how it can make the homemaker's job easier was the result.

Two dealers whose business had fallen off greatly were chosen to try the plan for two test weeks in August. Results: Dealer A (who sold one range during the last two weeks in July) sold 27 ranges. Dealer B (who sold seven ranges during the July period) sold 20 during the promotion. In addition, both dealers were able to trace sales of refrigerators and other appliances directly to the Detroit-Michigan program.

Appliance Shipments Drop; August Gas Sales Rise

Shipments of gas ranges and water heaters during the first nine months of 1951 amounted to less than during the same 1950 period, GAMA reports. Range shipments totaled 1,786,400 units, down 19.2%, and water heaters aggregated 1,522,400 units, 11.5% below 1950.

Manufacturers of gas-fired central heating equipment shipped 52,400 units in August, bringing the total for the first eight months to 389,300. In 1950, 670,600 units were shipped during the first eight months.

Sales of gas during August showed an increase of 16.1% over the 2803 million therms sold during the same month a year ago, according to AGA. For the 12-month period ended Aug. 31, utility sales rose to 46,104 million therms, up 15% from the same period last year.

Tenants View Display Van

Tenants of 30 apartment houses recently gathered to view Brooklyn (N. Y.) Union Gas Co.'s latest merchandising innovation —a mobile gas appliance display.

One of the company's delivery vans was decorated and outfitted with a gas refrigerator and gas range. More than 400 persons visited the display and 300 of them signed slips entitling them to chances on aluminum ware sets.

Brooklyn Union salesmen follow up by informing landlords of their tenants' interest in gas appliances.

As part of its celebration marking 100 years of gas service in the Detroit area, Michigan Consolidated Gas Co. has had nine murals painted by prominent Michigan artists.

The paintings present some of the aspects of life in the state and suggest the part gas has played during the past century. Titles are The Gas Flame—Symbol of a Better Way of Life, Early Detroit Settlers, First Gas Light—1851, A Michigan Home Kitchen in 1851, Early Michigan Restaurant Kitchen, Laying of Pipeline from Texas, Modern Gas Kitchen, Gas—Fuel of Michigan's Industry, and Modern Compressor Station.

Manufacturers

Advisory Group Tells NPA Need for Conservation

Study of conservation measures and simplification of sizes was recommended at the first meeting of the domestic water tank and water heater industry advisory committee with the National Production Authority, held late in September.

To substantiate the need for such measures, the committee reported that the industry's production has been cut to 60% below normal because of third and fourth quarter allotments. It is estimated that 419,000 fewer water heaters will be produced in the two quarters than the number estimated to be required, and inventories have been dropping.

NPA officials said the supply of steel strips and sheets is improving and that steel mills probably will be able to fill orders for all fourth quarter allotments. Zinc and copper, however, will continue in short supply, according to NPA.

Rockwell's Kerr Joins NPA

A. J. Kerr

A. J. Kerr, vice president of meter and valve sales for Rockwell Manufacturing Co. Pittsburgh, has been appointed chief of the valves and fittings branch, general components division, National Production Authority. He will work under the direction of Eugene S. McCarthy, director of the division, and will headquarter in Washington, D. C.

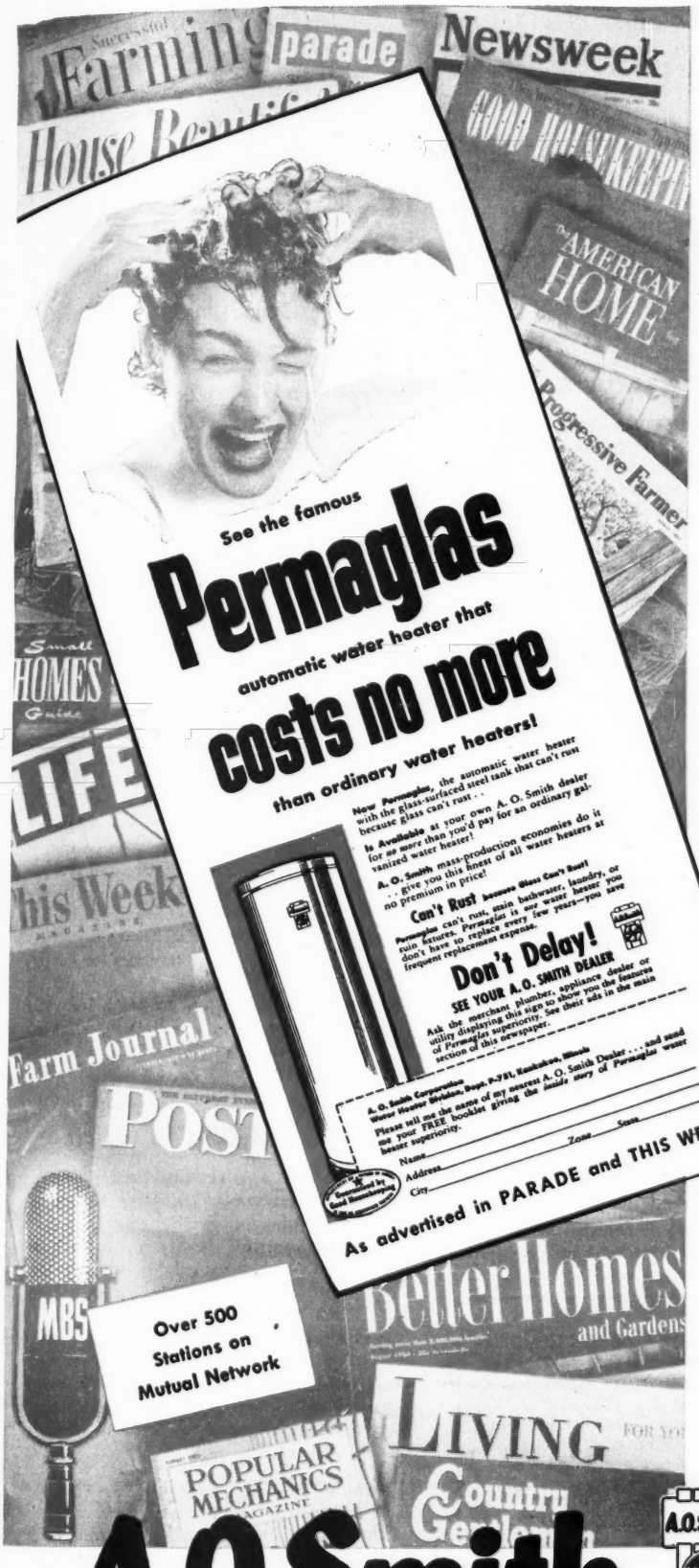
Charles W. Burrage, whom Mr. Kerr succeeds, is returning to his position with the Lunkenheimer Co., Cincinnati.

Newsnotes

Water heater sales executives for A. O. Smith Corp., Milwaukee, recently attended a two-day special school at the firm's product service division training facilities in Chicago. Classes running from 9 a.m. to 7 p.m., covered application, sizing, installation, and servicing of Permaglas and Duraclad water heaters.

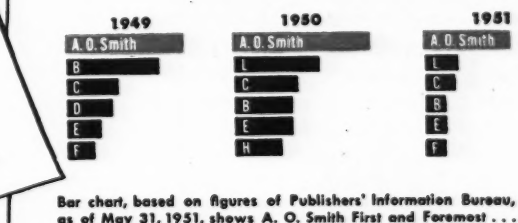
Additional territory has been assigned to J. R. Williams, Ohio representative for Welsbach Corp., Kitson Division. He will contact plumbing and heating wholesalers in Richland, Knox, Licking, and Fairfield counties in addition to those he already covered from his Dublin, Ohio headquarters.

Some Midcontinent manufacturing activities of Dresser Industries Inc. soon will be moved to a new Dallas site, for which a long-term lease was signed last month. The industrial property consists of a new plant building on about 20 acres of land bordering the Santa Fe railroad.


Farming
parade
Newsweek
House Beautiful
GOOD HOUSEKEEPING
AMERICAN HOME
Progressive Farmer
Small HOMES Guide
LIFE
This Week MAGAZINE
Farm Journal
POST
MBS
Over 500 Stations on Mutual Network
Better Homes and Gardens
POPULAR MECHANICS MAGAZINE
LIVING
Country Gentleman
See the famous
Permaglas
automatic water heater that
costs no more
than ordinary water heaters!
New Permaglas, the automatic water heater with the glass-surfaced steel tank that can't rust because glass can't rust . .
Is Available at your own A. O. Smith dealer for no more than you'd pay for an ordinary galvanized water heater!
A. O. Smith mass-production economies do it . . give you this finest of all water heaters at no premium in price!
Can't Rust because Glass Can't Rust
Permaglas can't rust, stain bathwater, laundry, or ruin fixtures. Permaglas is your water heater you don't have to replace every few years—you save frequent replacement expense.
Don't Delay!
SEE YOUR A. O. SMITH DEALER
Ask the merchant, plumber, appliance dealer or utility displaying this sign to show you the features of Permaglas superiority. See their ads in the main section of this newspaper.
A. O. Smith Corporation
Water Heater Division, Dept. P-751, Kankakee, Illinois
Please tell me the name of my nearest A. O. Smith Dealer . . . and send me your FREE booklet giving the inside story of Permaglas water heater superiority.
Name
Address
Zone
State
City
As advertised in PARADE and THIS WEEK

First and Foremost

A. O. Smith continues to blanket your community with National Advertising . . . consistently, convincingly, completely . . . making it easier for A. O. Smith registered retailers to sell *Permaglas* . . . the foremost water heater!



Bar chart, based on figures of Publishers' Information Bureau, as of May 31, 1951, shows A. O. Smith First and Foremost . . . the most consistent national advertiser of water heaters.

For complete information on *Permaglas* . . . the water heater with the glass-surfaced steel tank that can't rust because glass can't rust . . .

MAIL THE HANDY COUPON

A. O. SMITH CORPORATION
Water Heater Division, Dept. G-1151
Kankakee, Illinois

Please send me, without obligation, full information on *Permaglas* Water Heaters and Registered Retailer Profitunities in my area.

Name_____

Firm_____

Address_____

City_____ Zone____ State_____

A.O.Smith

AUTOMATIC WATER HEATERS

SALES: Boston 16 • Chicago 4 • Dallas 2 • Denver 2 • Detroit 21 • Houston 2
Los Angeles 12 • Midland 5, Texas • Milwaukee 2 • New York 17 • Philadelphia 3 • Pittsburgh 19
Seattle 1 • Washington 6, D.C.; SERVICE: Chicago 17 • Dallas 1 • Los Angeles 12 • Union, N.J.
International Division: Milwaukee 1 • *Licensee in Canada: John Inglis Co., Ltd.*

GAS CLASSIFIED

Classified advertising is set in 6-point type, without border or display, at the rate of 15 cents per word per insertion; minimum charge per insertion $3. Box numbers for replies count as 5 words. Count as a word each one letter word and each group of figures. Classified advertising is only accepted when payment accompanies order. Copy and payment must reach publisher's office prior to 10th of month preceding publication.

WANTED—SALES ENGINEER. GAS AND oil combustion equipment. Territory: Southern Illinois and Missouri. Salary and commissions. Give age, experience and education. Married or single. Write Box 160, GAS, 198 So. Alvarado, Los Angeles, Calif.

LP-GAS CONTRACTING & EQUIPMENT

More than 78 Peacock Plants prove . . .
"There's No Substitute For Experience"
PAUL E. PEACOCK, JR.
Box 268, Westfield, N. J. Westfield 2-6258

DEPENDABLE L-P GAS

UPG ®
FUEL SUPPLY EQUIPMENT ENGINEERING CONSULTING SERVICE
UNITED PETROLEUM GAS COMPANY
806 Andrus Building · Minneapolis 2, Minnesota

Contractors • Engineers • Consultants

LP-GAS SPECIALISTS
H. EMERSON THOMAS & ASSOCIATES, INC.
P. O. BOX 270, WESTFIELD, N. J.
TEL. 2-2800
Experience • Service • Reliability

M-SCOPE PIPE FINDER

MODEL AB
ONE MAN OPERATION
METAL CABINETS
HEAVY DUTY PERFORMANCE
ONLY
$149.50

FISHER RESEARCH LAB., Inc.
PALO ALTO, CALIFORNIA

A new 16-mm. 20-min. film entitled "The Blodgett Story" has been released by the G. S. Blodgett Co. Inc., Burlington, Vt. It was made solely to train heavy duty cooking equipment salesmen but should be interesting and instructive to restaurant and hotel operators. Narrator is Lowell Thomas.

Two new ranges have been introduced in the popular price field by Chambers Corp., Shelbyville, Ind. Labeled 41-C and 31-C, the models are 37⅝ in. wide, 29½ in. deep, and 42½ in. high. Features include the "in-a-top" broiler-griddle and four burners, including a giant 12,000-Btu burner.

Miscellany

North Shore Expands Plant

To meet an increasing demand for gas service, North Shore Gas Co., Waukegan, Ill., has begun the expansion of its North plant to augment the limited natural gas supply with manufactured for peak shaving.

Four 30,000-gal. propane storage tanks and a new heat exchanger will be added to the existing propane-air manufacturing facilities. A $50,000 overhaul and construction program is also in progress to convert the firm's present system from water gas to high-Btu oil gas production.

Much of the old equipment will be used in the conversion, including several oil storage tanks being salvaged from the dismantling of another plant.

Pipe Wrapping Firm Wanted

Brownsville, Texas, in the southeastern tip of the state, is looking for a firm to tar and paper wrap pipe to be used in the industrial expansion of its area. Interested parties have been requested to contact the Board of City Development.

Most pipe shipped into the area by barge requires rewrapping in Brownsville before it can be used. The board reports that fuel is cheap, with natural gas selling at one of the lowest rates in the nation, and wage scales are low.

Industry Told Scrap Need

Oil and gas operators have been urged by Oscar L. Chapman, petroleum administrator for defense, to search their properties for iron and steel scrap and worn-out materials and equipment.

"The oil and gas industry is one of the largest steel consumers, using about 10% of the country's yearly supply," Mr. Chapman said. "For this reason, even though the amount of scrap available . . . is relatively small in relation to consumption, the industry has an added responsibility to do its utmost to contribute to the nation's steel scrap pile."

If the steel industry is to reach its 1951 production goal of 110 million tons, about 3.5 million tons more scrap than originally estimated will be needed.

A recent test at a Kansas City, Mo. restaurant, reported by Gas Service Co., convincingly proves the economy of cooking with gas.

A 3-deck, 6-bun pan electric bake oven used 1750 kwh of electricity in 30 days. At the lowest possible electric rate of 2½ cents per kilowatt, the cost of operation would be $43.75. This oven was replaced with a 12-bun pan gas-fired bake oven which, in a 30-day period, used 28.8 Mcf of gas. At 45 cents per Mcf, the cost would be $12.96, a saving of $30.79 per month or $369.48 annually.

Incidentally, says Gas Service Co., the gas-fired oven is operating at part capacity and could handle two to three times the present capacity at a very small increase in gas consumption.

Tom Harmon, former University of Michigan all-American, has joined the selling team of A. O. Smith Corp., Milwaukee. Mell O. Haldeman Corp., Vernon, Calif., distributor for Smith water heaters, is sponsoring a Friday night television football forecast for the 1951 season.

Present at the contract signing were (standing) George Souther, Haldeman heating division sales manager, and H. F. Jacobsmeyer, A. O. Smith; (seated) Jack Manildi, president of Mell O. Haldeman; Tom Harmon, and H. L. Bilsborough, A. O. Smith.

Heating Limited in Utica

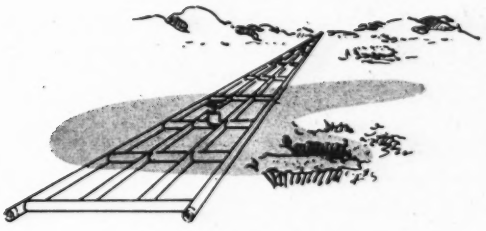
Restrictions against installation of gas heating equipment in buildings where the appliance utilizes more than 500,000 Btu/hr (except multiple family and apartment houses) have been issued by Niagara Mohawk Power Corp., Syracuse, for the Utica, N. Y. area.

Similar restrictions are already in effect in areas served by Niagara's Troy, Schenectady, Gloversville, and Glens Falls manufactured gas plants and will be continued after they are converted to natural.

18th Gas Test Run Halted

During the 18th experimental run at the Bureau of Mines pilot plant at Grand Forks, N. D., about 10,210 Mcf of potential industrial gas was produced from lignite, the bureau has announced.

The test run, voluntarily shut down after 947 hours of successful operation, used 438,415 lbs of lignite. About 85 MMcf of gas had been produced during the 18 test runs made since the plant began operating in 1945.



"A reservoir with an effective water drive can be compared to a network of inter-connecting pipes filled with water."

Storing Gas In

UNDERGROUND WATER SANDS

"I am convinced that the storage of gas in water sands can and will be successfully used . . ."

By DR. IONEL I. GARDESCU
Transcontinental Gas Pipe Line Corp.
Houston

THE storing of natural gas in depleted oil or gas fields is well known and is in common usage. Less is known of the storage of gas in water sands and some even question the effectiveness of such storage. This skepticism results in part because the mechanics of gas storage in water sands are not always understood and because several failures have been recorded in the past; nor are there too many major gas storage projects in operation that stand out as vivid examples of the efficiency of the method.

Among the projects that have failed is the storage of gas in a 1500-ft water sand in the New Harmony (Ill.) field, in 1942 and the storage of gas in a 6600-ft water sand in the Hastings (Texas) field in 1947 and 1948. The failures of these projects will be analyzed. In my opinion these failures do not discredit in any way the success and feasibility of storage in water sand but rather illustrate certain limitations and precautions that have to be taken.

I am convinced that the storage of gas in water sands can and will be successfully used in many cases where suitable geologic structures can be located in the vicinity of large natural gas consuming markets and where depleted oil and gas reservoirs are not available. As a matter of fact, the storage of gas in water sands has definite advantages over storage in depleted oil or gas fields.

Methods in Depleted Fields

The mechanics of gas storage in depleted fields are very different from those of water filled reservoirs. The very fact that an oil or gas reservoir has been depleted and now contains a very low fluid level or very low pressure gas is evidence that the oil or gas occurred in a pocket and there was no water to rush in freely and fill up the spaces left by the withdrawal of the oil or gas. That is not true of all oil or gas fields. In many fields and particularly in the Texas and Louisiana Gulf Coast areas, the sand in which the oil or gas occurs is very porous and the porosity of the sand extends far beyond the limits of the oil or gas accumulation. In these fields, as the oil and gas are being withdrawn the water keeps on flowing toward the voided spaces, and after millions of barrels of oil and billions of cubic feet of gas have been produced, the field still has almost the same pressure that it had before it was tapped.

The field is depleted in the sense that there is less oil or gas, but not in the sense that there are voids left in the reservoir, because all of these voids have been filled up with water. In such a case the storage of gas in an oil or gas reservoir with an active water drive is not different in any way from the storage of gas in a water sand. To store gas in such a field the water has to be forced out of the reservoir and has to flow through the sand, reversing its original direction of flow.

However, in a true depleted reservoir, as commonly encountered in the Appalachian area, the storage of gas consists of compressing the gas back into the voids that have resulted from the withdrawal of oil and gas. The water that surrounds the oil or gas accumulation in such a case is practically stationary and little if any gas could be stored by forcing out of the reservoir this accumulation of water. If a similar pocket of permeable rock surrounded by tight rocks were to be filled with water, such a reservoir could not be used for gas storage purposes.

Reservoir With Water Drive

A reservoir with an effective water drive can be compared to a network of inter-connecting pipes filled with water. These pipes extend for miles and miles in all directions and the water is under pressure. If this system of pipes is tapped at any one point and the pressure reduced, water will flow from the areas of high pressure toward the areas of low pressure (or the tap). If, on the other hand, water or gas is injected through the tap, there results an increase in pressure and the water will flow from the area of high pressure

surrounding the tap toward the areas of low pressure.

The next question is, where does the water go that is forced out of the reservoir? Numerous studies made on the movement of underground water show that if water is withdrawn from a sand through a well there is a lowering of the water level at the well and if test wells are drilled at various distances from the producing well, the water drop recorded by these test wells will be less and less the farther the wells are located from the producing well. At a few miles distant the record shows no movement of water. Computations show that actually there is no movement of water in these distant wells and that the water produced has caused an expansion of the large underground volume of water in the sand as a result of drop in pressure. The same phenomenon is noted in reverse where, by injecting water in an input well, the pressure is increased at the well and this pressure decreases with distance and is gradually absorbed by the compressibility of the water.

Oil reservoir engineers have made great progress in recent years in their study of movement of fluids in a reservoir as a result of injection and withdrawals of oil, gas, and water from the reservoir. Their studies are known as "material balance calculations" and their theories have been repeatedly checked with actual field performances in the East Texas field and many other important oil and gas fields. These studies and field observations definitely prove that gas can be stored in water sands and the rates of injection and pressures required can be predicted with reasonable accuracy.

Why Projects Failed

Reference was made earlier in this paper to two unsuccessful gas storage projects. In the New Harmony field in Illinois some 15 MMcf of gas were stored in a water sand at a rate averaging .5 MMcf per day. The injection pressure was approximately 250 lbs above the normal by hydrostatic pressure of 680 lbs. When the well was opened for production, it flowed at a rate of 450 Mcf per day and the pressure dropped to 400 lbs. However, by the end of the day the well started making excessive volumes of water and the well was shut in. The test was declared a failure. A careful analysis of the facts shows that the only failure of the test was the surging of the water which was pulled into the well by the suction resulting from the flow of gas. If a much larger volume of gas had been stored and if the gas-water level had been lowered the necessary distance below the well perforations, there would not have been any flow of waters with the gas.

The "coning" of the water, as the phenomenon is known to oilmen, results from a definite relation of rate of flow, reservoir characteristics, and position of the gas-water level with regard to the producing section. It occurs in any oil or gas field and can be prevented by lowering the rate of flow of the well or by raising the producing well section with regard to the water contact. In the case of gas storage, the water level can be lowered by adding more gas cushion. As mentioned above, the amount of gas cushion needed can be reasonably calculated or tested experimentally. In all other respects, the New Harmony field test in 1942 was a success. It proved that gas can be injected at a reasonable rate requiring pressures that were not excessive and the same rate of flow and pressure differential was maintained satisfactorily throughout the entire test period of 80 days.

Intercommunication

In the case of the Hastings field, some 230 MMcf were injected over a period of three months at a reasonably constant pressure of 3000 lbs. It took some 400 lbs pressure in excess of the normal hydrostatic pressure to start the gas flowing into the water sand. The well produced satisfactorily at a rate of 3 MMcf per day. When the rate was increased to 10 MMcf per day the well started making large quantities of water.

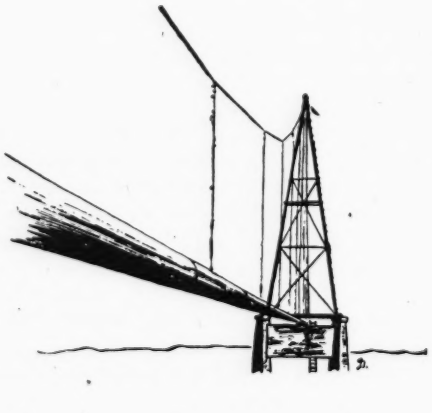
Only 7% of the gas injected in the water sand was recovered. The balance of the gas escaped to other sands as a result of the many faults that are present in the field and the many wells causing an intercommunication between the various sands. The 93% actually was not lost; it went to other wells and other connecting reservoirs. The test proved the mechanics and feasibility of gas storage in water sands but it also vividly pointed out the importance of checking very carefully all of the facts that control the accumulation and migration of gas and water in the reservoir. These controlling factors can be summarized as follows:

1. Perfect seal with well defined structural closure, no faults and no possible avenue of escape or migration of the gas out of the reservoir.
2. Carefully completed wells with complete cementations above the reservoir between the walls of the well and the casing.
3. Complete coring of the wells in order to determine any possible variation in sand porosity and permeability. If such variations are noted, the rate of injection and withdrawal of gas has to be controlled to prevent differential water encroachment.
4. A continual check on the position of the gas-water contact at various points of the reservoir and maintenance and control of rates of flow that will prevent any water coning.

All of the above safety measures can be easily carried out and do not present any difficulty or large expenditures. However, great care has to be exerted in selecting a reservoir and often exploratory drilling and a detailed study of the reservoir may condemn many a reservoir as being unsuitable for underground gas storage. A judiciously chosen water sand structure should not, however, offer any problem. On the contrary, such a reservoir would have several advantages over the depleted type reservoirs.

No Pressure Variation

A good water sand storage reservoir will take the gas at uniform rates without requiring any appreciable variation in injection pressure. The same is true with regard to gas withdrawal. Whether a billion, 20 billion or 40 billion cu ft are withdrawn, the pressure of the gas delivered will remain substantially the same because of the effectiveness of the water drive in the reservoir. This will reduce the stages of compression and greatly simplify operations. If greater or lower rates of flow are required, the corresponding operating pressures of the compressors can be predicted and necessary adjustments made. Deliveries at high rates of flow will require fewer wells and smaller gathering line to take care of the relatively high pressure gas of the water driven field, even when the reservoir is fairly well depleted, as compared to the handling of the low pressure gas of the sealed type reservoir under the same circumstances. However, both types of reservoirs will be used in the future and the selection between the two types will result from their availability in any one area rather than differences in performance.



This paper was presented at the annual meeting of the Independent Natural Gas Assn. of America in Oklahoma City on Sept. 24.

PG&E's Electric Motor-Driven Automatic Compressor Station

By RALPH S. NABORS
Pacific Gas & Electric Co., San Francisco

IN the past two years, Pacific Gas & Electric Co. has constructed several automatic compressor stations to support the gas system capacity during peak loads when normal line capacities are inadequate, at available pressures, to meet these demands. The compressor plant described in this article is the semi-portable installation at Hollister, Calif. This unit installation was completed early in January, 1950, and has since been used, as required, to bolster the load requirements for the Salinas-Monterey area.

Unit Description

This station contains two 800-hp electric motors driving two-throw motor-driven compressors with two CE-105, 12x10½ compressors. The total capacity of the plant is approximately 36 MMcf daily at 165 psig inlet pressure and 365 psig discharge pressure at 60° F and 30 in. mercury.

The electric motors, 3-phase, 2300-volt, 60-cycle, 880-hp unit power factor rotate at 450 rpm. They have inclosed collection rings, etc., for an explosion-proof installation, including static-proof exciter, ventilating blower for collector rings and exciter, and 3-phase, 220-volt, 60-cycle explosion-proof motors for oil pumps, jacket water pumps, and blowers. Equipment, not explosion-proof, is installed in a pressurized cabinet, the air for pressurizing being received from a filtered source outside the compressor building.

The incoming gas is passed through a conventional air bath scrubber, is then compressed and afterward cooled by passing through a force draft waterless cooler *(Fig. 1)*. A small section of the cooler is used for cooling the jacket water.

The motor, compressor, oil and water pumps, and the electrical operating mechanism and the intake and discharge headers are mounted, unit skidded, on a steel foundation. After the foundation mat was poured, the packaged unit was moved from the shop to the job site and set in place (see *Fig. 2)*.

This paper was presented at the PCGA transmission conference held last May in Bakersfield, Calif.

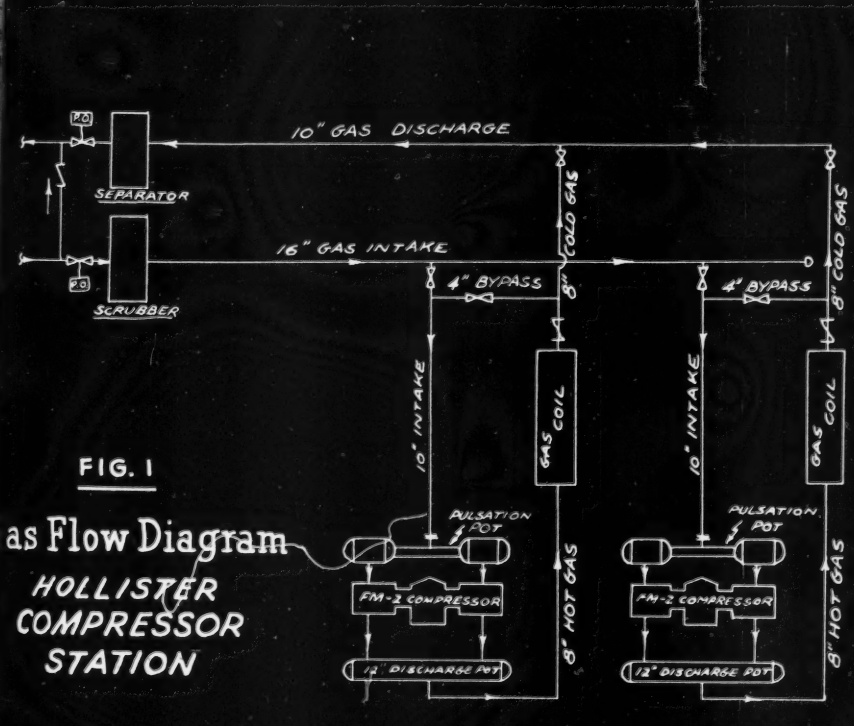


FIG. 1
as Flow Diagram
HOLLISTER COMPRESSOR STATION

Automatic Features

The fully automatic features of the plant distinguish it from the conventional compressor station. The units may be set to operate singly or in parallel.

The units start when pressure on the intake to the compressor drops to a predetermined minimum. When suction pressure is above this minimum, it is not necessary to operate the plant and gas will flow through the check valve installed between the intake and discharge headers. This setting may be changed to suit conditions of load and pressure requirements. A 3-way switch in the instrument air supply line to snap-acting pilots on the intake compressor valves insures that the unit is started without load. When the d-c field is applied, the pressure controller will supervise the loading of the valves as required to meet output requirement.

As the pressure starting switch closes, 115 volts are applied to two relays which are connected in parallel, each closing a contact. This starts motors on the blower, cooling tower fans, water pump, oil circulating pump and lubricator pump. After a 3- to 5-minute

warm-up period, a final series relay closes, completing the circuit to start the main motor and the exciter motor. Breaking the circuit on any of the auxiliary motors or failure of air supply will shut down the main motor. Pilot lights are installed to indicate cause of shutdown.

Summarizing, the plant has the following features:

1. It starts automatically on predetermined pressure conditions.
2. It utilizes a warm-up period of three to five minutes of oil, water and air circulating system before starting.
3. The units start without load.
4. Volume requirements to maintain set discharge pressures by selective loading are accomplished by means of suction valve lifters.
5. Failure of any of the auxiliary motors driving the water pump, oil pumps, circulating blower or failure of air supply shuts down the compressor.
6. Rupture of the header piping will cause air operated valves on intake and discharge headers to close and shut down compressors.
7. The compressors shut off if intake pressure rises beyond a point where compression is not required.
8. Automatic features may be bypassed and the plant operated manually.

Operation Experiences

The unit, except for minor exceptions, operated satisfactorily from the start. After the initial adjustments and minor changes were made, one major problem, requiring remedial measures, was evident. That problem was abnormal vibration.

On putting these two compressors in operation abnormal vibration resulted. Vibration existed in the intake piping and even included the intake dust scrubber. At certain steps in unloading this vibration was very severe. The discharge piping was also subjected to severe vibration, including the headers and the gas cooling towers.

Experimentation revealed that an orifice placed in the incoming and discharge lines was effective in alleviating the pulsation. To avoid large pressure drops caused by the insertion of the orifices, it was decided to use venturi tubes; also it was decided to install expansion bottles between the venturi and the intake valve. (This arrangement is shown in *Fig. 3.*) A venturi tube was also installed in the discharge line close to the cylinder. These installations, plus a change in the sequence of unloading, were effective in materially lessening vibration. Pressure drop tests were run on a 26 MMcf/d load on a single unit. About 235-lb intake pressure is required to handle this amount. The maximum discharge was 350 psig. Under these conditions the following pressure drop data were obtained:

Suction	1.21 psig	.49%
Discharge	3.44 psig	.98%

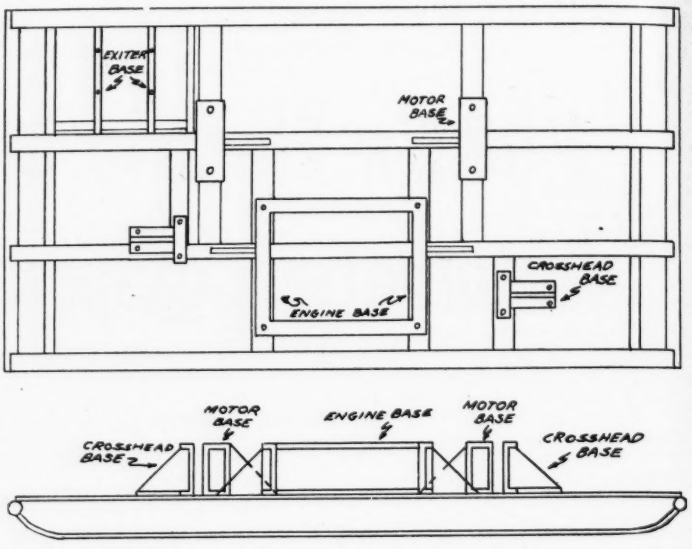


Fig. 2. Top and profile sketches of skid mounting for units of the station.

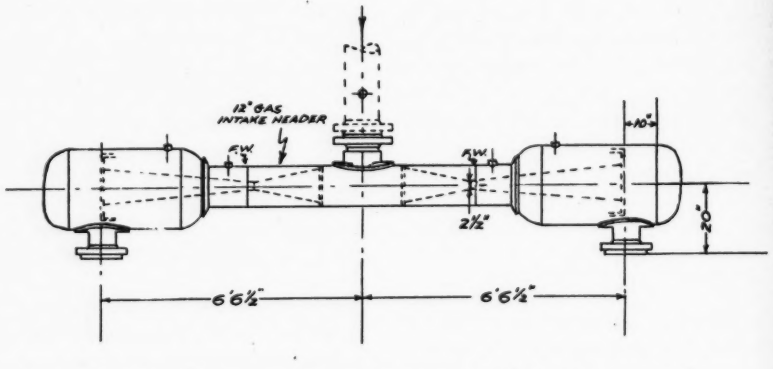
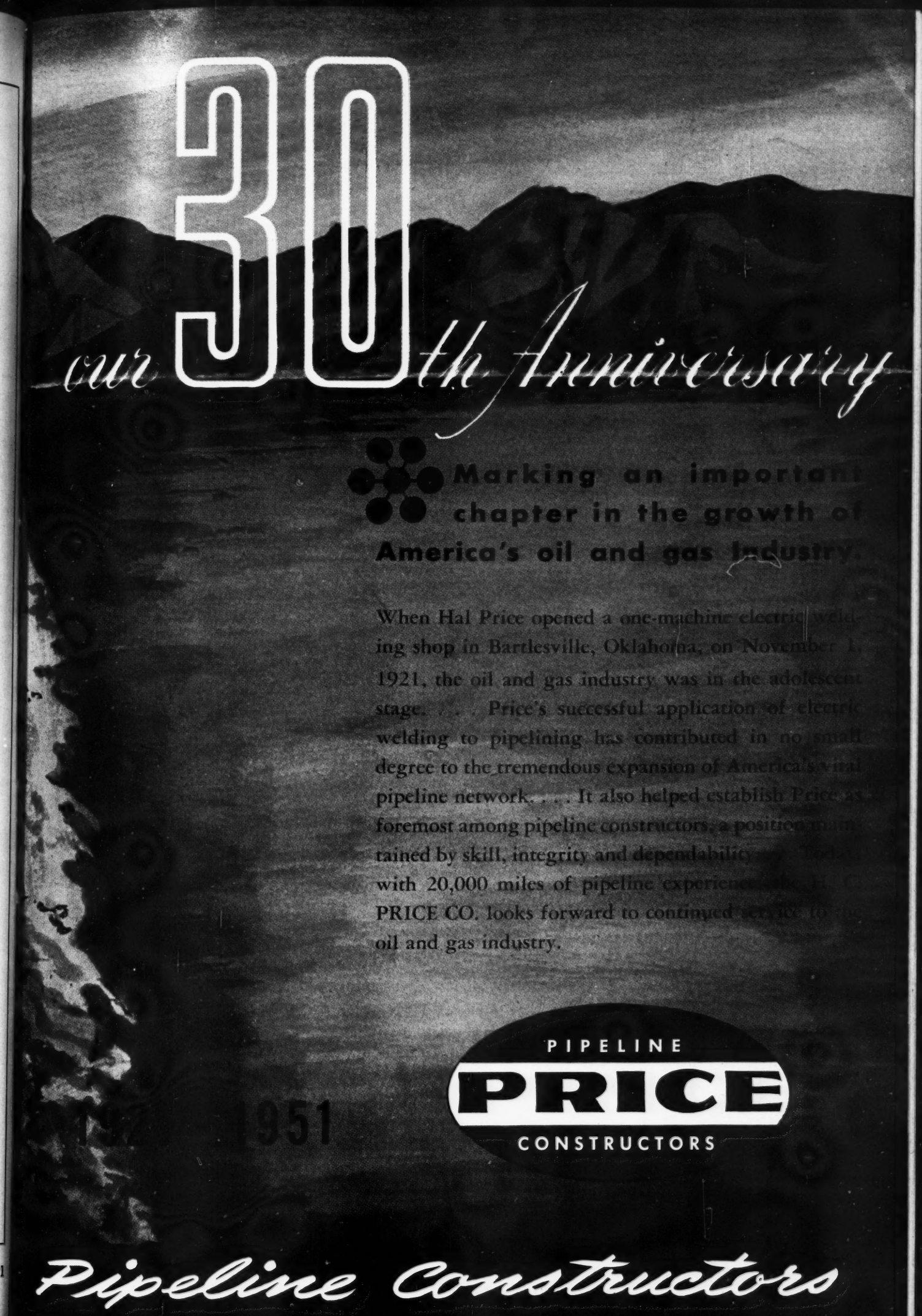


Fig. 3. Assembly gas intake pulsation pots. Scale: ⅜ in. = 1 ft.

TABLE 1. UNIT OPERATION DATA

	Unit No. 1	Unit No. 2
Hours run during month	636	600
Hours run, year to date	2,402	2,070
Oil consumption (qts)	292	275
Oil consumption (qts per hr)	.46	.46
Jacket water added (gals)	4	4

Number of days compressors required	31
Total compressor hours operated	1,236
Electric consumption kwh, compressors	561,673
Electric consumption kwh, auxiliaries	26,327
Average intake pressure, psig	218
Average discharge pressure, psig	341
Compression ratio	1.53
Total gas compressed, Mcf	1,015,649
Total ihp - hrs developed (meter kwh)	788,300
Total bhp - hrs developed (calculated)	613,056
Per cent mechanical efficiency	77.77
Ihp - hrs indicated	637.7
Bhp - hrs developed	496
Average bhp per MMcf	25.3
Average ihp per MMcf	32.3
Per cent station load factor	51.5
Bhp - hrs per gal lubrication oil used	4,001
Scrubber oil added	239
Gals. scrubber oil per MMcf	.235


our 30th Anniversary
Marking an important chapter in the growth of America's oil and gas industry
When Hal Price opened a one-machine electric welding shop in Bartlesville, Oklahoma, on November 1, 1921, the oil and gas industry was in the adolescent stage. . . . Price's successful application of electric welding to pipelining has contributed in no small degree to the tremendous expansion of America's vital pipeline network. . . . It also helped establish Price as foremost among pipeline constructors, a position maintained by skill, integrity and dependability. Today, with 20,000 miles of pipeline experience behind it, PRICE CO. looks forward to continued service to the oil and gas industry.
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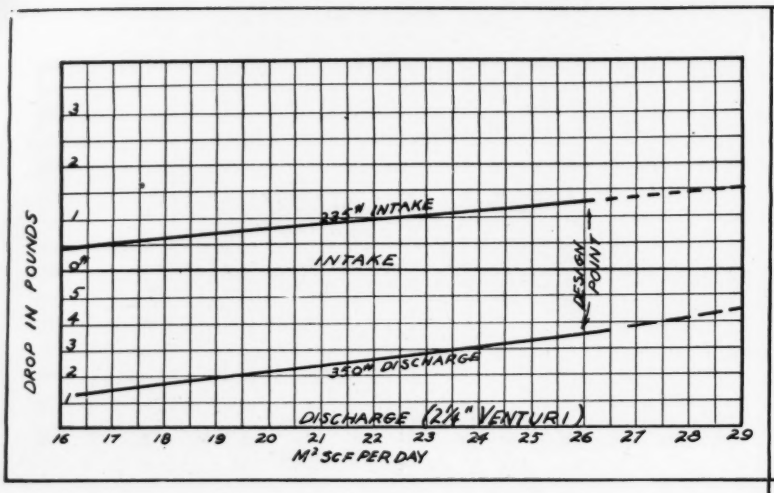


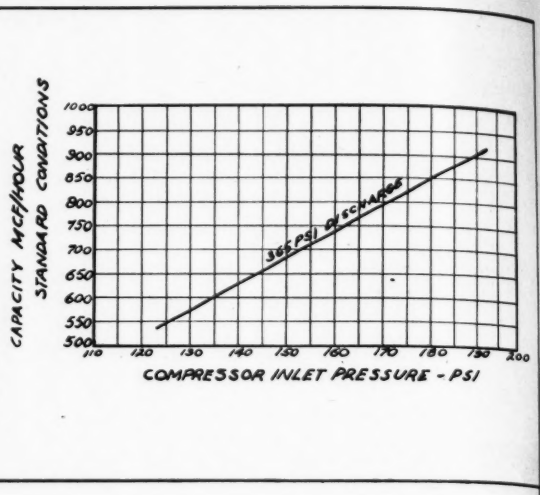
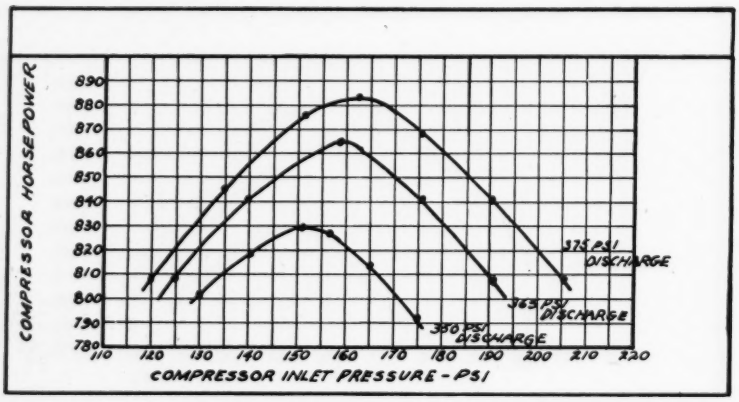


Fig. 4. (Above) Venturi dampeners pressure drop.

Fig. 5. (Above right) Capacity curve.

Fig. 6. (Below) Horsepower curve.

Fig. 7 (Right) Compressor load curve.



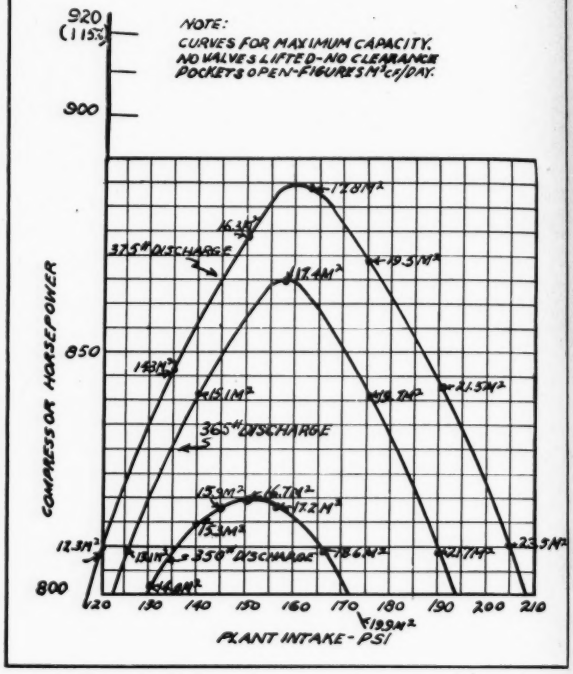


Fig. 4 shows the effect of venturi pulsation dampeners installed.

Some difficulty was experienced with valve plate breakage in the early operation experiences with the units. The original installation was made with bakelite compressor valve plates in both the intake and discharge sides of the compressor cylinders. The bakelite rings did not prove satisfactory in the intake side for the type of service to which they were subjected. The fingers in the valve lifters pressed against the valve plate when the unit was on partial load in such a manner as to cause fatigue and breakage of the composition plates. Changing to steel plates in the intake valves cured the trouble and little breakage was experienced thereafter. The composition plates were left in the discharge valves. At approximately 3000 hours running time all the discharge valves were overhauled. Approximately 40% of the plates were damaged enough to warrant replacement.

Two compressor suction valves were damaged during the first 3000 hours of operation to such an extent that replacement was required. Foreign particles in the gas stream caused this damage.

Scrubber oil consumption is well within the performance guaranteed by the manufacturer. The monthly operating data included in this article shows an average consumption of .235 gals. per MMcf. The guarantee was .5 gals. per MMcf at maximum capacity of 36 MMcf at 165 psig.

The plant is operated unattended except for a short period each morning when an employee visits the station for routine check and replenishment of lubrication oil, jacket water, and scrubber oil as required. This routine includes checking before and after cooling temperature of the gas, lubricating oil pressure and temperature, checking of all lubricators for operation. (Filling is not required as these lubricators are kept constantly at a full level with oil pumped from the crankcase sump.)

Operating data for a typical month are shown in *Table 1*.

Conclusion

Tests run on the units indicated that they were capable of the output for which they were designed (see *Figs. 5, 6,* and *7*); that unattended and fully automatic compressor stations can, under certain conditions, be depended on to give reasonably satisfactory service; that the mechanical efficiency of such a station is within the limits of normal expectations. It is of vital importance that some sort of an alarm system be supplied to notify of plant failure. This plant has two houses and a pipeline office located on the property, and signal bells are wired to both the cottages and the office to give immediate notification of a plant failure.

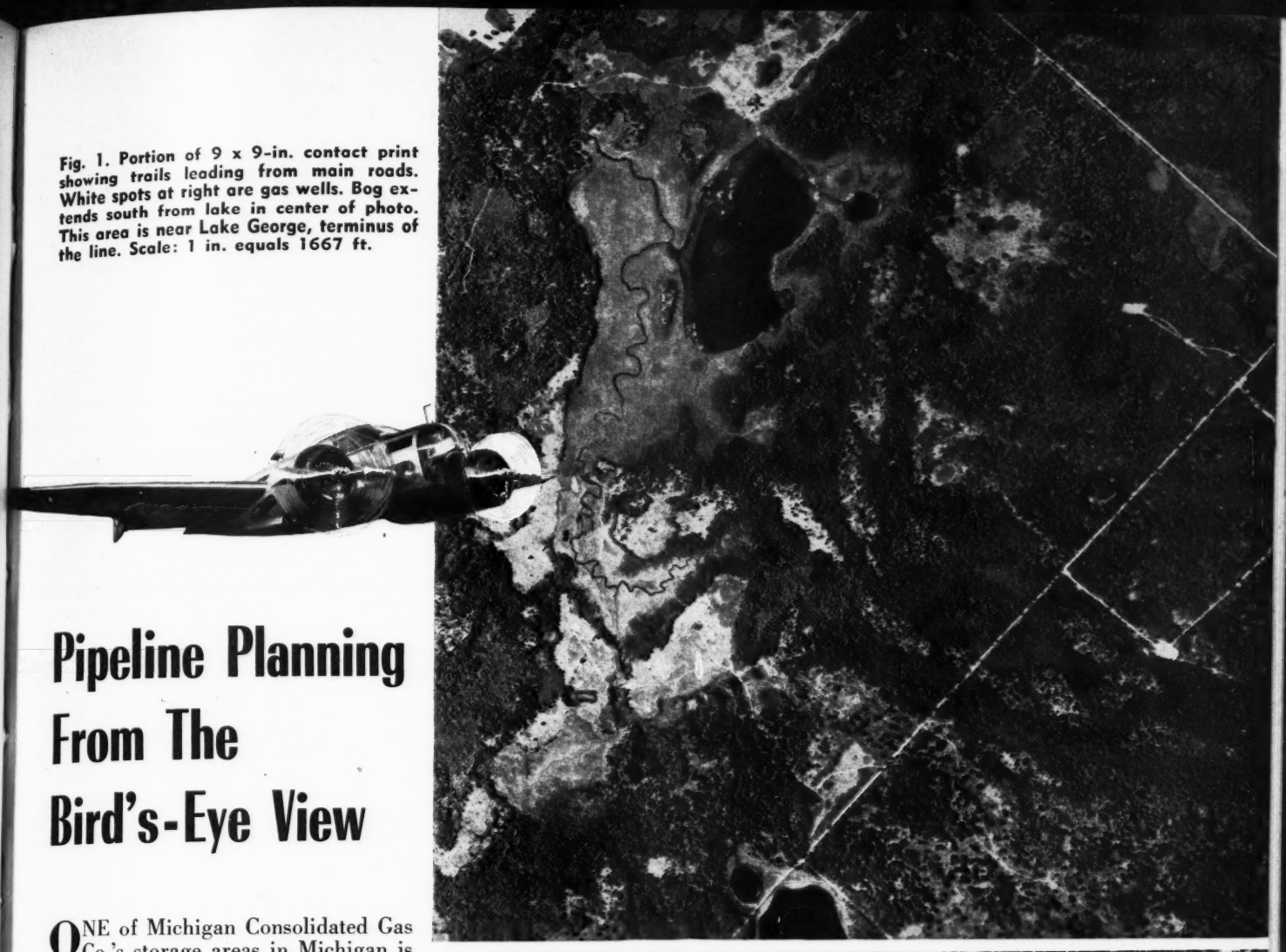


Fig. 1. Portion of 9 x 9-in. contact print showing trails leading from main roads. White spots at right are gas wells. Bog extends south from lake in center of photo. This area is near Lake George, terminus of the line. Scale: 1 in. equals 1667 ft.

Pipeline Planning From The Bird's-Eye View

ONE of Michigan Consolidated Gas Co.'s storage areas in Michigan is the Lincoln-Freeman field near Lake George. The gas for this storage field comes from the Austin field compressor station near Big Rapids, and the Austin field manifold is a terminal for distributing gas in Michigan. During the summer months the wells are repressured, and in winter the gas is taken out of this natural storage, dehydrated, and put into the lines serving such cities as Detroit, Grand Rapids, and Muskegon.

Exclusive

The old 4- and 6-in. line from the Austin manifold was not big enough to fill the capacity of the storage field, so a 24-in. line was planned to replace it. Ford, Bacon & Davis, consulting engineers for Michigan Consolidated, decided to use aerial photography for planning the route of the new line, as they knew that this method would save time and money on the project.

The Abrams Aerial Survey Corp. of Lansing, Mich. contracted to do the aerial surveying, and flew the area of the pro-

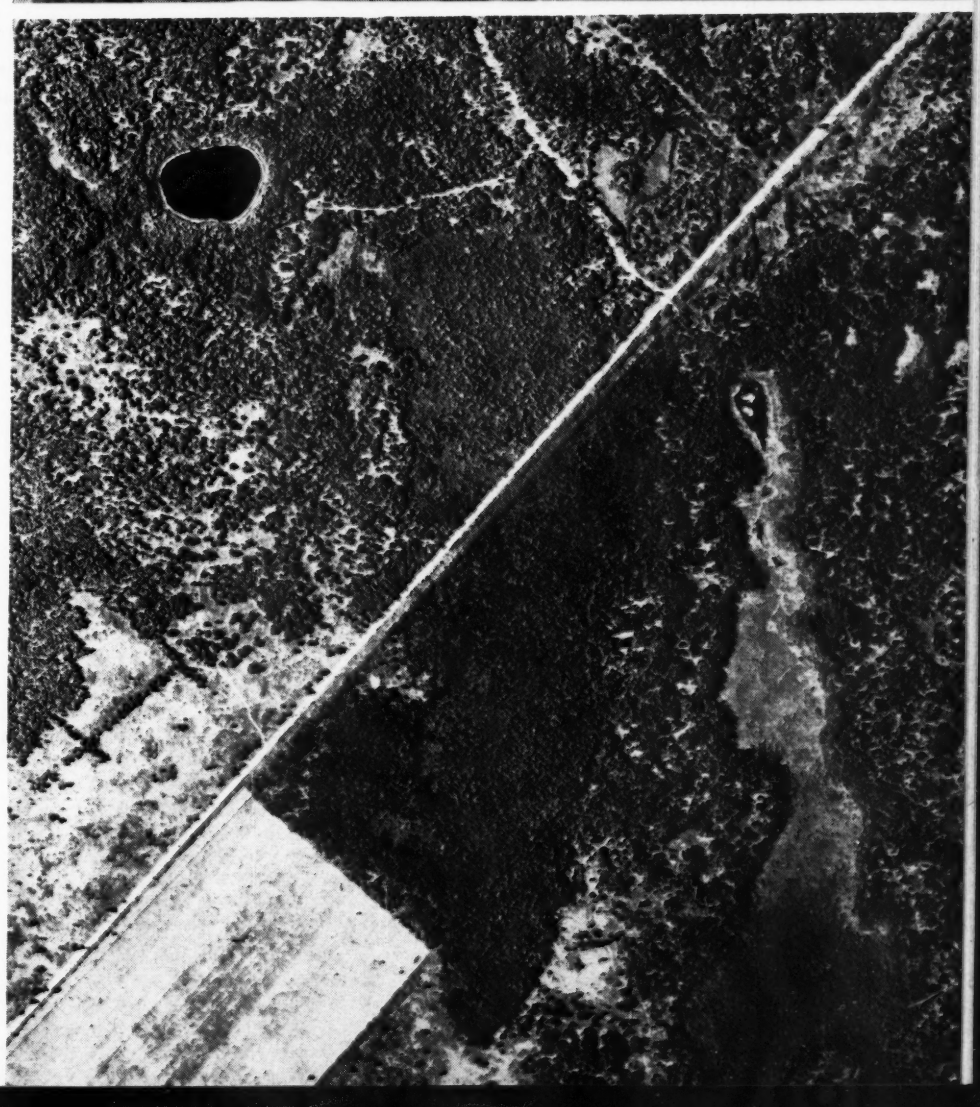


Fig. 2. Portion of aerial photographic mosaic showing bog at right of highway and narrow neck at which it was crossed. Using existing maps, the lake would have been on the line route. Route chosen was drawn directly onto mosaic boards. Scale: 1 in. equals 1000 ft.

posed route on Sept. 6, 1950. The trip was made in a twin-engine Beechcraft AT-11 (illustrated) that is especially equipped for aerial photography. This airplane has special camera mounts, additional fuel capacity, and extra navigation aids so that the most exacting mapping standards can be met. Pilots are skilled at maintaining constant speeds and furnishing a level platform for the precision camera equipment that is used in aerial surveying. A precision mapping camera with an 8¼-in. focal length was used, and the flights were made at an altitude of 13,750 ft. Although the pipeline was to be about 32 miles long, 40 line-miles were photographed in order to give broader coverage in some areas where the line was being re-routed. Abrams furnished Ford, Bacon & Davis with two sets of contact prints, two photo-indexes, and an aerial photographic mosaic of the area.

A portion of a contact print is illustrated in *Fig. 1;* the actual size is 9 in. by 9 in. The scale of the prints for this project was 1:20,000 (1 in. equals 1667 ft).

Tailor-made Equipment

Photographs for contact prints are taken in such a manner that they overlap 60%. This overlapping is accomplished with a special type aerial camera timer called an intervalometer *(Fig. 3).** Careful flying by the pilot enables the skilled cameraman to set the intervalometer so that the pictures automatically overlap the desired amount.

The purpose of the overlap is to picture the same ground detail from two different angles. The result is that with the precision stereoscope* the ground can be seen in third-dimension—which means that the whole route is actually brought right into the engineer's office.

With a height finder* attached to the stereoscope the engineer can measure the heights of terrain features and other objects that are on the overlapped prints (which are called stereo-pairs). In the project under consideration it was not necessary to measure terrain features, as the terrain was of a rolling nature, but stereoscopic study was often made of the prints.

The photo index serves the same purpose as the index to a book: It allows one to locate contact prints for specified areas. After being individually numbered, the prints are assembled and photographed. The photograph of this assembly is the photo index. If one wishes to study a given area stereoscopically or use the contact prints for some other purpose, he simply looks on the photo index, notes the numbers of the prints that cover that area, and then selects them from the contact print file.

A mosaic is an assembly of scaled prints that form a composite photograph of the area. After the mosaic is completed it can be reproduced at various scales. In this case the mosaic was made at a scale of 1 in. equals 1000 ft. The mosaic was in four sections and totaled 16 ft in length. Azimuth was retained through straight-line assembly, and accurate scale was controlled with ground measurements. The proposed route for the pipeline was plotted directly onto the mosaic boards.

In planning the route, two distinct regions were involved. For the first 20 miles the route paralleled the old line, and for some distance went through settled and cultivated areas. All of the detail can be seen clearly on the aerial photographs: roads, cultivated fields, houses, every tree, and also the route of the old pipeline. In this area the mosaic and the contact prints were used to avoid cultivated fields, timber stands, houses, orchards, and similar epensive items. At one point along the line there was a small oil field, and this was also by-passed.

The second region that the line went through was wild, heavily timbered, and full of small lakes, swamps, peat bogs, marshes, and other low-drainage areas, with almost no cultivation or settlement. In this region the line was re-routed. In this instance the aerial survey was particularly valuable, for the available maps do not show all of the detail, with the result that if a straight line is run, often the route leads right into a small lake, or across a large bog or swamp. The survey party must then go back and probe toward a satisfactory line. Sometimes the second line will go for a distance and then again hit an area that would be very expensive to string line across. That means that the probing might be repeated again and again—a work that is very expensive as well as time-consuming. With aerial photographs all of the detail is seen, and the route can be laid out at once in such a manner as to avoid the bad terrain as much as possible.

The section of the mosaic *(Fig. 2)* that is illustrated shows this situation. The small lake in the upper left-hand corner had to be avoided, and there was a large bog further along the route. Using the aerial photographs, it was easy to cross the bog at the narrowest point. The line ran downward because at another point along the route there was a tremendous bog and mud lake area. Instead of endless probing to get through this terrain, the mosaic enabled the engineers to see the problems at once, and to plan the route to cross the best possible areas.

The aerial photographs were also used by the contractors in making their bids for the project. With these maps they could see the direct route and also estimate for clearing timber. Another advantage was that the river and swamp weights needed could be computed and ordered in advance.

Mosaics Better than Maps

Many uses were made of the aerial survey while the work was in progress. Progress reports could be checked on the mosaic and the speed of stringing in each kind of area could be computed. This made it easy to compute future progress accurately for a glance at the mosaic would show the type of terrain that was ahead for the next week, or other period of time, and the spots that would be fast or slow in construction showed up at once.

Because all of the detail can be seen on the contact prints they were used as maps. Often there would be three or four sections without roads, and existing maps do not show trails and small roads. The field party kept one set of prints and the project engineer had the other. With their use much time was saved in taking the most direct routes.

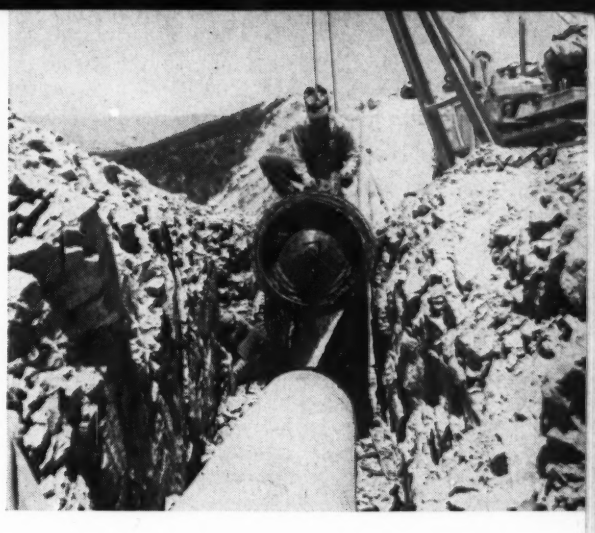
In addition to the savings mentioned above, one of the most important ones is still to be told. On one section of about 12 miles of the line the use of the aerial mosaic led to the use of a direct route that saved 1½ miles of line. This one item paid the survey cost many times over.

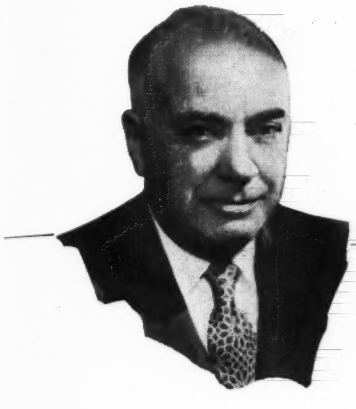
Fig. 3. Interior view of airplane, looking forward from the pilot's compartment, shows the aerial camera installation in the glass nose of the aircraft. The instrument to the right above the camera is the intervalometer.

*These instruments are manufactured by the Abrams Instrument Corp., makers of precision photogrammetric instruments, and sister corporation of Abrams Aerial Survey.

• **BIG INCH.** Now a major gas pipeline, this wartime oil line was a job that gave Price a big boost as a general contractor. Photo (at left) shows conversion of the line to gas late in 1946.

• **BIGGEST INCH.** First 30-in. high pressure line ever laid, this 214-mile stretch from Blythe, Calif., to Los Angeles was a widely heralded accomplishment.





Thirty years ago, H. C. Price foresaw the potentialities of electric welding, and with this technique as his forte built a small welding shop into a nationwide concern that has contracted jobs for more than 100 major companies.

Price Celebrates 30 Years, 20,000 Miles of Pipelining

FROM a one-machine electric welding shop to a multi-million dollar construction firm with 20,000 miles of pipeline experience behind it!

That's the nutshell story of the H. C. Price Co., which on Nov. 1 is celebrating the 30th anniversary of the inauspicious opening of the Electra Welding Co. in Bartlesville, Okla. It was there, in 1921, that Harold C. Price launched a $2500 venture, complete with one welding machine, and hired himself two assistants. Today, that nucleus has burgeoned into a nationwide organization with a hundred or more full-time employees, including four 16-man spreads and two "Somastic" divisions.

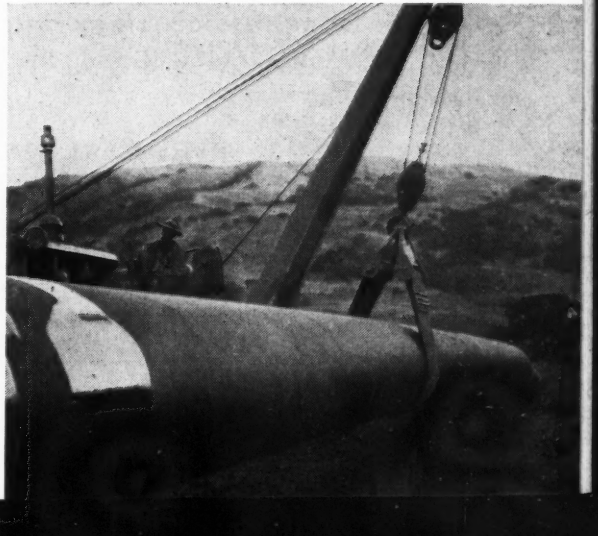
Accomplishments of which the Price organization can boast are the Super, Biggest, and Toughest Inches, for which the company was a general contractor; the Big and Little Big Inch, top-priority war jobs on which the Price company handled a large share of the assignments; and numerous other projects scattered throughout 33 states, Canada, Alaska, South America, and the Middle East.

It was in Alaska and Canada that Pricemen tackled one of the most spectacular construction jobs in history. With America's entry into World War II, Price had broadened its scope from welding contracting to general contracting, and when the famous Canol project was authorized, Price joined W. A. Bechtel Co. and W. E. Callahan Co. for the bid. Pipeliners from the three companies pushed 2000 miles into a wilderness, laying 1700 miles of pipeline, building a refinery at Whitehorse, and carving out 2000 miles of road over which they transported thousands of workmen and tons of material to locations 1000 miles from civilization.

Indeed, it was by meeting the challenges of World War II that the company was enabled to take its place among the leading contractors of the nation. Price foremen and welders were supplied to several shipyards and to an aircraft modification plant. The company helped build an ordnance plant and helium tanks for the Bureau of

• **TOUGHEST INCH.** More than 200 miles of almost vertical slopes in the rugged West Virginia country inspired the nickname. Pricemen won a lot of goodwill on this job for Columbia Gas System.

• **SUPER INCH.** The Bartlesville company was one of several to lay the 500-mile line from the California-Arizona border to San Francisco. The 34-in. diameter of this line makes it the largest high pressure gas line.



One man — 5 to 15 minutes

In the SKINNER-SEAL SPLIT COUPLING CLAMP, gasket is SEALED at break by Brass Band; at top where compression rings intermesh, by Monel Metal Band. Insures against recurrence of trouble by introducing a degree of flexibility in the line. Each clamp tests to 800 pounds line pressure. Sizes 2"-24" inclusive. Be prepared — order your supply today.

WRITE FOR CATALOG!

M. B. SKINNER CO., SOUTH BEND 21, INDIANA

SKINNER-SEAL SPLIT COUPLING CLAMP

Mines. At Army request, it established a welding school to train recruits for emergency pipeline work in foreign oil fields.

The Big and Little Big Inches were laid under stress of war conditions. Nazi submarines were taking an appalling toll of allied tankers, threatening to choke off the vital oil supply to the east coast when the government authorized the construction of the 24- and 20-in. lines. Working at top speed, skilled pipeliners opened the new supply lines in record time. Pricemen did their full share, welding 225 miles of the Big Inch and joining with Bechtel and O. E. Dempsey Co. as general contractors to lay 80 miles of the Little Big Inch.

Ironically, Harold Price, whose most important achievements have been in the pipelining field, was slow to adopt it as his chief line of endeavor. His first try at it, on a job for Empire Gas & Fuel Co. at Caney, Kan., in 1922, was a bitter disappointment. One hundred fifty joints of 12-in. pipe, which his company had undertaken to shop-weld, squirted water like a sprinkling system when hydrostatically tested at 300 lbs. The company returned to its first specialty, the welding of oil field storage tanks, and left pipelines alone for the next six years.

In 1928, Texas Pipe Line Co. awarded Price a contract for field-welding a 169-mile stretch of 8-in. oil line near Corsicana, Texas. This was the first electric welded line of more than 50 miles in length, and started the company on a new tack. Eighteen welding machines were used, being mounted on horse-drawn farm wagons. With welders averaging as many as 25 welds per day, the 20,881 welds were completed in four months.

Shielded Arc Process Used

Price was on its way. The next year it adapted the shielded arc process, using it on a 32-mile, 20-in. line for Cities Service. This job marked the first time electric welding had been used on such large-diameter pipe without expansion joints or coupling between the welds. With its new successes, Price changed over all its welding equipment to handle this type of work.

The company's pioneering continued through the depression. Price was among the first to abandon the back-up ring, which was making necessary costly procedures. It was also among the leaders in adopting the stove-pipe welding technique.

In 1936, under its new name, H. C. Price Co. (Electra Welding had given way to the more precise name of Welding Engineering Co. in the early '20s), the company joined Bechtel in forming Industrial Engineering Co. to manufacture and distribute Somastic coating under a Standard Oil of California license. In 1946, Industrial Engineering Co. was dissolved, the Price company taking over the exclusive distribution and manufacture east of the Rockies.

J. S. Dewar
Somastic V.P.

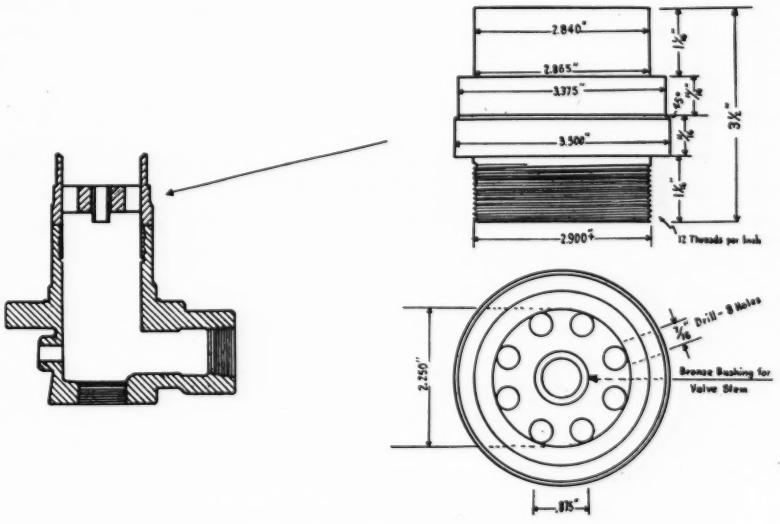
J. B. Harshman
Pipeline V.P.

E. L. Gallery
Secy.-Treas.

John M. Thomas
Pipeline Mgr.

Record-Holding Firm Now

Emerging from the war as a full-fledged general contractor, H. C. Price has undertaken some of the biggest pipelining jobs in the country. Under Vice President J. B. Harshman, the pipeline division has set records and won nationwide recognition. A lot of people across the nation who don't know much about pipelining have come to know the spread superintendents—G. A. Reutzel, R. K. Shivel, C. E. Shivel, and particularly the legendary Charlie Ice.



Gas Engine Check Valve Seat and Guide Unit Eliminates Valve Cage Replacement

Operations at Panhandle Eastern Pipe Line Co.'s Glenarm station have been improved because of an invention of Lawrence A. Page, a machinist.

Mr. Page's device is an air starting check valve seat and guide for a 1000-hp Cooper-Bessemer gas engine. It makes it unnecessary to buy a complete valve cage when the seat and guide are worn, according to the inventor.

The unit replaces the valve seat and guide of the air starting check valve assembly (CB drawing G22B-130) which lets the air into the combustion chamber to start the engine. It is made of cast iron, as is the original part. The old cage is first cut off and threaded on the inside; the new part is turned on the lathe to the same shape as the part cut off, and is threaded on the outside.

Seat and guide are made at the same time so that they will fit true and the valve will seat properly. The new bronze bushing is then pressed into the valve stem guide. Holes to admit air are drilled with a 7/16-in. drill. The completed part is then screwed into the old cage valve, which is lapped in. When it is seated, the spring is replaced and the valve assembled.

Two hours machine work is required to cut off the cage and make the seat and guide. Installation requires 10 minutes.

Drawing is provided courtesy of *Panhandle Lines*.

...A SERVICE THAT COVERS ALL

Complete Plant Construction Facilities

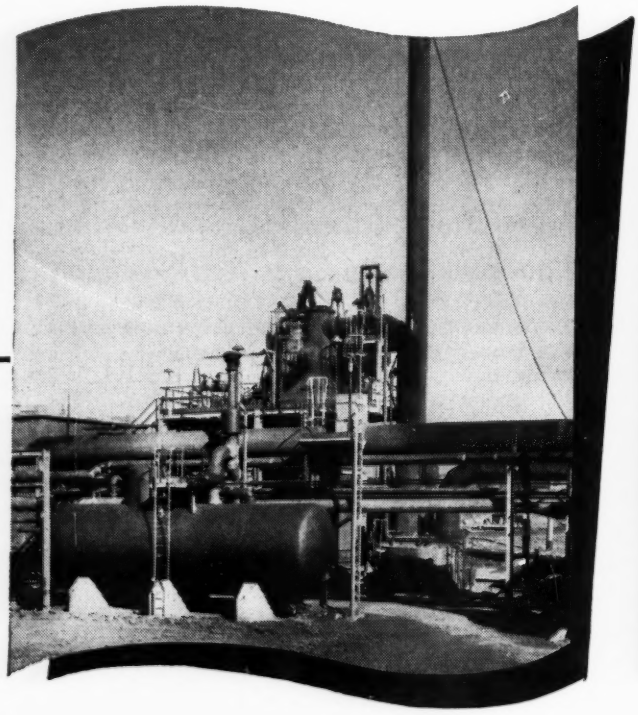
The facilities provided the gas industry by United include every phase of engineering and construction work. They begin with a preliminary study of individual requirements, and range through complete construction and preliminary operation.

United offers *long experience in gas plant design*—more than 60 years. United provides *efficient apparatus*—has pioneered major developments for the manufactured gas industry. United has *large, well-organized construction forces*, experienced in all details of gas plant construction. United provides *skilled plant operators* to assure the most efficient results from use of apparatus.

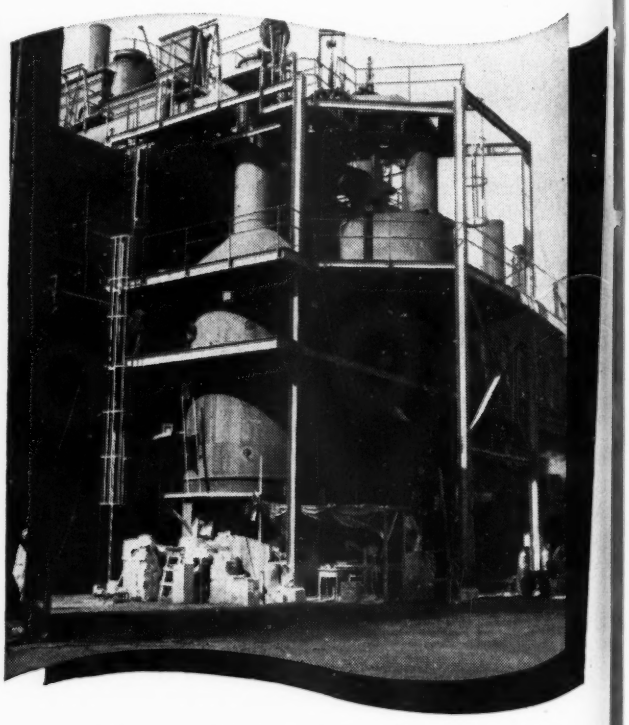
Current and recent United installations for the gas industry include:

Cyclic Catalytic Reforming*
Natural Gas Utilization
Oil Gas
Carburetted Water Gas
Liquefied-Petroleum Gas
Synthesis Gas

*Patents Pending



U.G.I. Cyclic Catalytic Reforming Process installation at plant of Allentown-Bethlehem Gas Company, Allentown, Pa.



Installation of U.G.I. Cyclic Catalytic Reforming Process for The Philadelphia Gas Works Company, Phila., Pa.

YOUR GAS CONSTRUCTION NEEDS

Complete Pipe Line Construction Services

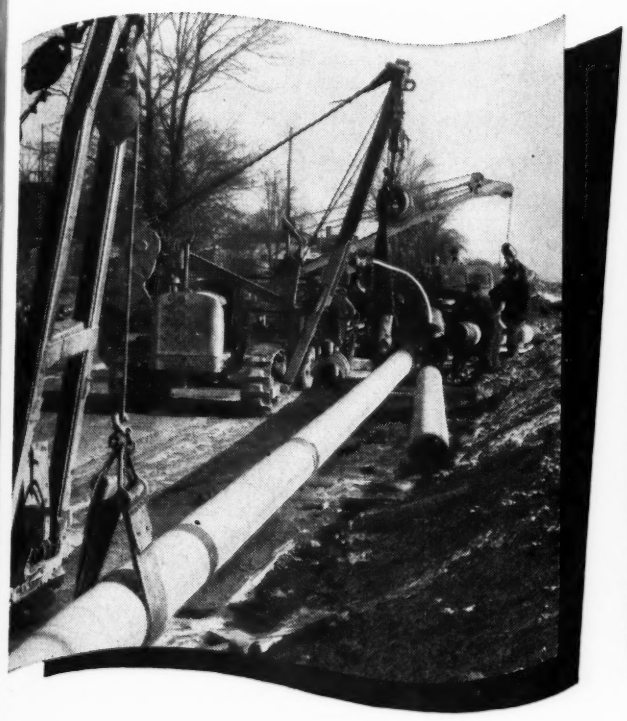
United's organization, which through the years has handled major projects for the gas industry, is available to you for pipe line construction work. Our experience includes the engineering and construction of lateral pipe lines, distribution main extensions and river crossings of various types and under many conditions.

United's pipe line services are flexible, and may be adjusted to meet your specific needs, from a single phase of the work to complete engineering and construction management of the job. Thoroughly experienced forces are available to augment the engineering and construction department of your company to any extent required.

UNITED ENGINEERS & CONSTRUCTORS INC

NEW YORK 17 PHILADELPHIA 5 CHICAGO 2

WITH A BACKGROUND OF OVER SIXTY YEARS' EXPERIENCE



Stringing pipe along highway for Citizens Gas and Coke Utility, Indianapolis, Indiana.

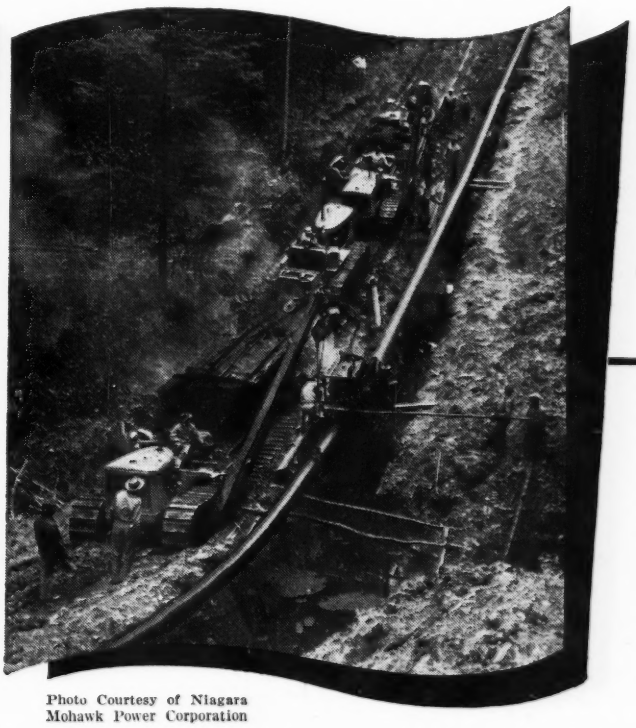


Photo Courtesy of Niagara Mohawk Power Corporation

The construction spread on a recent pipe line project for Niagara Mohawk Power Corporation, Syracuse, New York.

PIPELINE NEWS

New England Using Natural; 46-Cent Rate Set by FPC

New Englanders began cooking with natural gas early in October. About 75% of the customers which Northeastern Gas transmission Co. plans to serve in the area were waiting only for conversions to be completed.

Texas gas first flowed into the mains of Springfield (Mass.) Gas Light Co., and the changeover there was well under way. Worcester Gas Light Co. expected to be using 100% natural by the end of October, and Holyoke Gas Light Co. said its conversion should be finished by Oct. 21. Crews from the latter job were to move into the territory of Pittsfield Gas Light Co.

Actual use of the fuel had been delayed after its arrival in New England because of rate disagreement between Northeastern and the FPC. The company originally proposed to charge 44 cents per Mcf but, because of increased costs, it asked the commission to approve a 53-cent rate. FPC said no, but finally allowed a 2-cent boost to 46 cents.

Major Pipeline Projects Ready for 1951-52 Winter

Construction of several major pipelines was completed or nearing completion last month.

Tennessee Gas Transmission Co., Houston, reported that its 1951 program, designed to increase the company's capacity to more than 1200 MMcf daily, stacked up this way: A 303-mile extension from Buffalo to Massachusetts and 491 miles of loop line in five states were completed. Fifty-three miles of loop in Kentucky was 65% finished. Three new compressor stations at Albany and Cambridge, Ohio, and Hamburg, N. Y., were to go into service by Nov. 1. Enlargement of seven existing stations (which, with the new stations, will add 54,500 hp to the system) was 90% completed.

On Oct. 1, a month ahead of schedule, gas began flowing through Trunkline Gas Co.'s $80 million, 1300-mile line from McAllen, Texas, to the Midwest. With a daily capacity of 250 MMcf, the line will boost Panhandle Eastern Pipe Line Co.'s capacity to 850-MMcf daily.

Texas-Illinois Natural Gas Pipeline Co. is planning a special Christmas present for gas users in the Chicago area. Its 1400-mile, $130 million line linking the city with Texas gas fields is expected to be completed by then, with 75% of the 374 MMcf daily capacity going to Chicago.

Already, 10,000 customers of Peoples Gas Light & Coke Co. and 10,000 persons in the Public Service Co. of Northern Illinois suburban area have been given permission to connect heating units for use this winter. When the line goes into operation, each of the utilities will authorize another 20,000.

Remaining work on the project consists of 20 miles of line southeast of Little Rock, Ark., and a Mississippi river crossing near Cape Girardeau, Mo.

Gathering Tax Battle Looms

A court fight is expected over Texas' gas gathering tax of 9/20 of 1 cent per Mcf levied by the state legislature earlier this year.

First payments of the tax were due last month, and all companies were expected to pay under protests. The courts will decide whether the tax is levied on interstate commerce, a power reserved for Congress.

TRANSMISSION EXPERTS at the AGA convention in St. Louis included the following Clark Bros. Co. (Olean, N. Y.) representatives: (from left) Fred Hayes, Houston district manager; George Probst, western regional sales manager; F. L. Laverty, general sales manager; Robert Smith, new Chicago representative; and William Dobbins, Washington district manager.

United Finishes 90-Mile Marshland Project

(Continued from Page 95)

in the New Orleans area.

In laying the line, Brown & Root crews were forced to forego, in practically every instance, use of the "pipeliner's friend," the versatile side boom tractor. The marshy terrain is not wet enough for boats and is too wet for anything else.

A big part of the 16-in. pipe was laid in dredged canals. Dredges chewed their way down the right-of-way and were followed by barges from which the pipe was strung and laid. At some spots, through use of wooden mats, draglines were able to gouge out a trench, and in others an ingenious contraption called a pirogue cutter was used. Pirogues, the tricky little dugout canoes used by trappers, can get through the marshes, and a cutter mounted on the front of such a boat can hack a path through the rank grass and muck. Where these methods failed, dynamite was used to blast a trench.

All open water pipe was laid from barges, and the remainder was shoved through the trench from ramps. Floating islands which move around according to the wind added a new hazard to the operation.

Two Mississippi river crossings were laid in Louisiana, dual 10-in. lines near Venice and an 8-in. line above Pointe a la Hache. There were put in during the winter when the water was low. All the pipe was barged in from pipe yards on the Harvey canal near New Orleans where the joints were processed for laying. Each 40ft joint has a ½-in. layer of Somastic corrosion protection.

To overcome the natural buoyancy of the pipe, the Rosson and Richards Barite process of cement coating was used. Whirling brushes sprayed on a ⅞-in. layer of concrete while the joint turned on a lathe-like machine. With the coating each linear foot of 16-in. pipe weighs 152 lbs. Since the terrain in this area is not subject to the strong currents and tides found in open Gulf waters, only a small amount of negative buoyancy is needed to keep the pipe in place.

United Gas Lets Contract

United Gas Corp., Houston, has let a contract to Louisiana-Mississippi Pipe Line Construction Corp. for the construction of a 12-in., $140,000 line to supply gas to Biloxi, Ocean Springs, and d'Iberville, Miss.

Purpose of the 13,500-ft section, according to the company, is to enable it to meet growing requirements in the area this winter. Pipe for a crossing of Biloxi Bay was being wrapped and cement coated last month, and construction was expected to begin in mid-October.

Court Decision Speeds Line

Denial of a motion to dismiss a condemnation proceeding involving a 180-acre tract in Somerset county, New Jersey, has eliminated an important legal obstacle to the proposed construction by Algonquin Gas Transmission Co., Boston, of a 61.5-mile line to connect New England with the Big Inch line.

Both the township of Bernards and the holder of a $35,000 mortgage on the tract had asked for dismissal of the proceedings on the ground that the company had failed to meet statutory requirements.

Superior Court Judge Daniel J. Brennan, who denied the motion, appointed a condemnation commission and directed it to report on Nov. 3.

Michigan Gas Utilities Project Approved by FPC

Temporary authorization for construction of some 77 miles of pipeline in Michigan has been granted Michigan Gas Utilities Co., Battle Creek, by FPC. The $1.5 million system will have a daily capacity of about 11 MMcf. Panhandle Eastern Pipe Line Co., Kansas City, has been ordered to deliver 5 MMcf per day to Michigan Gas.

A 22.7-mile line from Panhandle's system near Marshall will run south to Coldwater. From there, a 20-mile line to Hillsdale, a 22.5-mile line to Sturgis, a 5-mile section from Hillsdale to Jonesville, and a 6.5-mile stretch from the Marshall-Coldwater line to Union City will be built.

Towns to be served, in addition to those mentioned above, are Bronson, Quincy, Tekonsha, and Burr Oak. Michigan Gas presently serves Coldwater, Sturgis, Hillsdale, and Quincy with propane-air gas.

Texas Commission Reports Increased Gas Flaring

Gas flaring, which was curbed in the early postwar years by rigid state regulation in Texas, is on a dangerous upgrade, according to the state railroad commission.

Chairman Olin Culberson recently cited figures showing that 2⅓ times as much gas was lost by flaring during July as during January. While oil production increased 8.6% during that period, he said, gas flaring jumped almost 137%. At the July rate, some 66,000 MMcf would be wasted per year.

West Texas gasoline plants last month were to report the daily average volume of residual gas flared between Sept. 1 and Sept. 24. The move was a follow-up to the commission's earlier warning that too much gas was being wasted. If lines for moving the gas or plants for cycling it are not available, it may be necessary to reduce production in offending fields, Mr. Culberson said.

Natural for Illinois Cities

Union Gas & Electric Co., Bloomington, Ill., has been granted a temporary FPC certificate to build a 33-mile, 8-in. line from the facilities of Texas Illinois Natural Gas Pipe Line Co. in Piatt county, Ill., to a connection with Union's existing plant in Bloomington. Also included are facilities necessary to serve customers in the area crossed by the line.

Estimated cost of the proposed line and related facilities is $892,136. In addition, Union will spend about $133,214 to convert appliances to use natural. The line will serve natural to Bloomington, Normal, Farmer City, Le Roy, Downs, and adjacent rural areas, all in Illinois.

Safer Gas Well Drilling

Vertical Shooting with Shaped Charge

Charles E. Altman, assistant superintendent of New York State Natural's Tioga district, looks over shaped charge apparatus in Clinton county (Pa.) gas field.

New York State Natural Gas Corp., pioneer successful user of the shaped charge for vertical shooting in drilling operations, has, through popularizing the new development, made a major contribution toward eliminating fire and injury hazards in the Clinton county, Pennsylvania, gas field.

Employment of the new technique has also marked a forward step in gas conservation since, for bringing a gas well in, the new method substitutes blasting for the older method of using tools that could fly out of a well into the rig under intense pressure, cause sparks, and set off costly and dangerous gas-consuming fires.

Anticipations are that the innovation will spread to other areas where drilling operations are in progress or contemplated.

Edward C. Inghram, superintendent of production and storage for New York State Natural, who conceived the idea of using the shaped charge for vertical penetration of the cap rock above a high pressure gas area, shares credit for the innovation with E. H. Williamson, assistant superintendent of production and transmission for The Peoples Natural Gas Co. The two men worked out the details for the first successful experiment in the Leidy field.

Although the shaped charge is not new and has been employed in various ways—including horizontal shooting in gas wells—it was never successfully used vertically in bringing in a new gas well until New York State Natural employed it to bring in the Mabel Calhoun well in Clinton county.

Composed of 10 lbs of a slow-burning, gelatin-like powder, the equivalent of 2½ qts of nitroglycerine, the shaped charge has a Cyclonite base.

The explosive agent is made in the form of an inverted cone. The downward force of the blast, which has the effect of turning the cone wrong-side out, has a velocity of 14 miles per second, and causes a downward penetration through rock of approximately 4 ft.

The explosive can be detonated either with a Bolshevik bomb, an earlier model used in the Clinton county field, or the newer, improved "zero hour" bomb, which is currently being utilized.

Briefly, the method of applying the shaped charge for vertical blasting-in of gas wells is as follows:

As a well is drilled, it is correlated by logging or coring methods with other wells in the vicinity so that drilling may be stopped in the cap rock immediately above the high pressure pay sand. Drilling equipment is then removed from the hole and a prepared shaped charge is lowered to the well bottom by means of a "shooter's line" or, preferably, a parachute-like umbrella.

The explosive agent, which is activated by a timing arrangement, is detonated after it reaches the bottom of the well.

The force of the downward-directed blast causes the jet to penetrate the cap rock, and the well is thus brought in without the hazard which occurs when an upshooting gas flow forces drilling tools up the well-hole faster than the hoisting mechanism can lift them.

New York State Natural and other companies in the Clinton county area are now using this method almost exclusively in wells where high pressure and volume are expected.

Originators of the shaped charge vertical drilling technique were Edward C. Inghram (left) and E. H. Williamson.

Colorado Springs Firms Granted Merger Extension

At the request of Colorado Interstate Gas Co. and Canadian River Gas Co., both of Colorado Springs, the Federal Power Commission has extended from 4 to 10 months the time for completion of the merger of the two firms. The companies now have until Dec. 31.

Colorado's acquisition of Canadian River's facilities was authorized by the commission last Feb. 28. In June the companies sought an extension because of the length of time the matter had been pending before the SEC.

In its recent order, FPC denied a request by Natural Gas Pipeline Co. of America, Chicago, to amend its petition to intervene in the proceedings.

Leidy Line Completed

On Oct. 15, Manufacturers Light & Heat Co., Pittsburgh, was scheduled to start sending 100 MMcf daily through its new 144-mile pipeline connecting the Leidy producing area of central Pennsylvania with Pittsburgh.

Constructed to relieve an expected fuel shortage in the area this winter, the line is to carry natural only to the utility's present distribution territory, chiefly western Pennsylvania.

THE PIG WITH THE POKE
CLEANS PIPE LINES
THE VERY LATEST
Williamson Pipe Line Pigs*
FOR CLEANING
NATURAL GAS PIPE LINES
4" Size—TYPE JRN. 2" to 4" sizes. Will pass 1½ R-90° Bends. No valves other than full diameter thru port valves. Use TYPE SCN-51 for 6" size.
8" Size - TYPE WC-11. 8" to 14". Will traverse 6-foot radius field bends, full diameter side openings at 45°. SPRINGS COMPENSATE for BRUSH WEAR.
20" Size - TYPE GP-2. 16" to 30" 200-lb. SPRING forces the brushes against pipe wall — COMPENSATING for WEAR. Will traverse round opening gate or plug valves. SPRINGS and BRUSHES are identical and interchangeable for all types and sizes of GP-PIGS.
24" Size - GP-3. 18" to 30". Sizes will pass 1½ R-30° Bends. SPRINGS COMPENSATE for BRUSH WEAR ASSURING full section cleaning efficiency.
GP-3 consists of two Type GP-1 Pigs— Each Unit may be used as individual pig.
*Patents Pending
T. D. Williamson, Inc.
TULSA 9, OKLAHOMA

United to Sell Facilities

An application has been filed with FPC by Martin Wunderlich, Omaha, and Lee Aiken, Corpus Christi, in connection with the proposed acquisition of certain facilities from United Gas Pipe Line Co., Shreveport.

The properties include 678 miles of line as well as compressor station facilities comprising United's north Texas division and Wichita Falls district. They would be operated as a unit with other properties to be acquired from United Gas Corp. and Union Producing Co.

Capital cost of all the facilities is estimated at $5 million.

Drilling Spurs Gas Output

An additional supply of natural gas will soon be available from the Ventura area in southern California, as a result of increased drilling activity. Production in the field, north of Los Angeles, has required expansion of the pumping facilities of Southern California and Southern Counties Gas Co.'s.

In 1950, delivery of natural gas from the Ventura field averaged 76.2 MMcf daily. Last June it jumped to 88.9 MMcf, 88.4 in July, and 92.7 in August. It is estimated that daily delivery will reach 110.7 MMcf by 1955.

The Los Angeles companies are spending $71,500 on the project, which includes installation of a 400-hp compressor.

Ark-La Asks 16-Mile Line

Arkansas-Louisiana Gas Co., Shreveport, has applied to the Federal Power Commission for permission to build about 16 miles of 8⅝-in. line from Haynesville, La. to an Arkansas Fuel Co. plant near Magnolia, Ark. There the gas will be processed and sent through Arkansas-Louisiana's system to its customers in central Arkansas.

Work has already begun on a gathering system to pick up gas from 19 wells in Claiborne parish recently contracted for by Arkansas-Louisiana.

The new line will be used with two parallel existing ones. When the system is completed, it will carry some 80 MMcf daily.

Pipeline Newsnotes

A natural gas boom in northeastern Pennsylvania was predicted last month when a wildcat drill in Mehoopany township, Wyoming county, released an estimated 150 Mcf of natural. Gas was struck at about 940 ft in sand and lime rock. The area is 40 miles northwest of Scranton.

Southwest Gas Corp., Barstow, Calif., has announced that the California Public Utilities Commission has approved delivery of natural gas to Barstow from Pacific Gas & Electric Co.'s Super Inch line. The commission also approved a rate cut for Barstow, the first small California city to receive gas from the 34-in. carrier.

Gastonia, N. C., received natural gas early in October. Public Service Co. of North Carolina Inc. estimated that conversion of the city's 1500 ranges, 800 water heaters, and 67 refrigerators would take about 10 days.

Some 1400 employees and 25,000 stockholders of Texas Eastern Transmission Corp., Shreveport, last month received thir first copies of *The Inch,* a new quarterly magazine. In addition, another magazine strictly for employees will be issued quarterly, between publication dates for the larger edition. The magazines are under the supervision of Jack Clarke, director of public relations.

Three Columbia Gas System subsidiaries have received an FPC okay to build certain facilities and to retire others on their systems in Pennsylvania, West Virginia, Maryland, and New York. No new markets will be served. Manufacturers Light & Heat Co., Cumberland & Allegheny Gas Co., and Home Gas Co., all of Pittsburgh, will spend $1,853,063 for the project.

FPC has affirmed its order of last Feb. 15 authorizing Lake Shore Pipe Line Co., Cleveland, Ohio, to acquire, construct, and operate pipeline facilities to supply the northeastern Ohio area with natural gas. Lake Shore has satisfied conditions of the original order, FPC said, and the commission's February denial of applications filed by Erie Gas Service Co. Inc. and Grand River Gas Transmission Co., competing companies, is final.

Brooklyn (N.Y.) Union Gas Co. will spend $110,000 to build 3700 ft of line in Brooklyn to supply natural to the Williamsburg power plant of the New York City board of transportation. The gas will be used as boiler fuel for the generation of electricity. FPC approved the construction last month.

PROGRESS REPORTS

Planned

AMERE GAS UTILITIES CO., Charleston, W. Va. Docket G-1716 for 33.6 miles of line in West Virginia.

ARKANSAS-MISSOURI POWER CO., Blytheville, Ark. To build line from Big Inch to serve 12 towns in two states. To start within year.

CENTRAL WEST UTILITY CO., Kansas City, Docket G-1682, four alternate plans to serve Clay county, Mo.

CHICAGO DISTRICT PIPELINE CO., Joliet, Docket G-1756 to build 15 mile, 30-in. line in Cook county, Ill.

CITIES SERVICE GAS CO., Oklahoma City. Docket G-1704 for a 10-mile, 26-in. line between its Welda and Ottawa stations in Franklin county, Kan.

CUMBERLAND & ALLEGHENY GAS CO., Pittsburgh. Docket G-1773 for 35 miles 10-in. from Mountain Lake park, Md. to Monongalia county, W. Va.; 11 miles in various sections of Preston county, W. Va. and Garrett county, Md.; 800-hp and 1200-hp stations in Garrett county, and 1200-hp station in Preston county.

EAST TENNESSEE NATURAL GAS CO., Knoxville. Docket G-1336 for a 100-mile, 16-in. line from near Knoxville to Kingsport, Tenn. with appurtenant equipment.

EL PASO NATURAL GAS CO. Docket G-1629 for 10.4 miles 30-in., 36 miles field lines, 37,160 hp in main line stations, 18,910 hp in field sta-

CUT CORROSION PROBLEMS DOWN TO SIZE...

WITH TAPECOAT*

—the Coal Tar Coating in Handy Tape Form

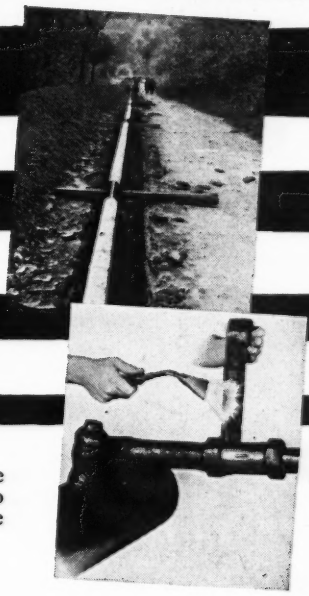
—Sized to the job

24" WIDTH

TAPECOAT — the economical coal tar coating for "cigarette-wrapping" mechanical couplings, large diameter pipe, joints, bends and drips.

18" WIDTH

TAPECOAT—the practical coal tar protection for "cigarette-wrapping" of large couplings, pipe bends, and joints on large diameter pipe.



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TAPECOAT — the distinctive, time-tested coal tar tape for spiral-wrapping welded field joints, service connections, pipe under streets and sidewalks, and pipe through building walls.

For more than 10 years, Tapecoat engineers have specialized in pipe joint protection. Call on them to help you meet your individual requirements. Write today for complete details.

The TAPECOAT Company

Originators of the Coal Tar Tape for Pipe Joint Protection

1535 LYONS STREET • EVANSTON, ILLINOIS

*Reg. U.S. Pat. Off.

tions, field gathering systems, and miscellaneous facilities.

EL PASO NATURAL GAS CO. Docket G-1631 for 112.9 miles 30-in., 179.5 miles field lines, 98,200 hp added capacity plus 36,540 hp in field stations, field gathering systems, and miscellaneous facilities.

EL PASO NATURAL GAS CO. Docket G-1630 for 25,050 hp at new and existing stations, 50.9 miles field lines, 2700 hp at a field plant, gas wells and miscellaneous facilities.

GULF-MICHIGAN GAS TRANSMISSION CORP., St. Louis, for 680-mile, 30-in. line from Perryville, La. to St. John, Ind. with three compressor stations totaling 30,800 hp.

IOWA-ILLINOIS GAS & ELECTRIC CO., Davenport. Docket G-1721 for a 41-mile, 10-in. line from Washington county to Cedar Rapids, Iowa.

MICHIGAN CONSOLIDATED GAS CO., 130-mile, 24-in. line paralleling present line from Austin storage field near Big Rapids, Mich. to Detroit.

MIDSOUTH GAS CO., Little Rock, Ark. Dockets G-1445 and 1680 for 240 miles of line in Greene, Crittenden, St. Francis, Lee, Phillips, Monroe, Woodruff, Poinsett, and Cross counties, Ark.

MISSOURI CENTRAL NATURAL GAS CO., Macon, Mo. Docket G-1509 for 25 miles of 6-in. from Moberly to Macon, Mo.

MONTANA POWER CO., Butte, to O'Connor Construction Co. for 23 miles of 6-in. and 15 miles of 8-in. from Hart Mountain field, Wyo., to Warren, Mont., and convert an 8-in. oil line from Warren to Billings, Mont.

NATURAL GAS STORAGE CO. OF ILLINOIS, Chicago. To build facilities to develop an underground storage area 15 miles southwest of Kankakee, Ill.

NEVADA NATURAL GAS PIPE LINE CO., 114 miles of 10¾-in. line from Topock, Ariz., to Henderson, Las Vegas, and North Las Vegas, Nev.

NEW RIVER GAS CO., Radford, Va., 50-mile line from Atlantic Seaboard's system in W. Va. to a point near Radford with laterals to four towns.

NORTHERN NATURAL GAS CO., Omaha. Dockets G-1442 and G-1511 for 13.9 miles of branch and a measuring and regulating station near Humboldt, Iowa and 1.5 miles of branch and a similar station near La Platte, Neb.

NORTHWEST NATURAL GAS CO., for 700 miles in Washington, Idaho, Oregon.

PACIFIC GAS & ELECTRIC CO., San Francisco. Docket G-1651 for 141 miles 34-in. loop and 22,780 hp at authorized stations.

PACIFIC NORTHWEST PIPELINE CORP., 2175 miles of 26-in. from southern Texas to Seattle, Wash., Vancouver, B. C., via Oklahoma, Kansas, Colorado, Wyoming, Idaho, Oregon, Washington.

PIEDMONT GAS CO. INC., Hickory, N. C. Docket G-1617 for 28 miles 6-in. line, metering and regulating stations.

ROCKLAND LIGHT & POWER CO., Nyack, N. Y. Docket G-1728 for 22 miles transmission line between Orangetown and Tomkins Cove, N. Y.

SHENANDOAH GAS CO., Lynchburg, Va., for 59 miles from near Cedarville, Va., to cities in Virginia and West Virginia.

SOUTHERN CALIFORNIA GAS CO., Los Angeles. Docket G-1698 for a 35-mile line in the Antelope valley, Calif.

SOUTHERN CALIFORNIA GAS CO. and **SOUTHERN COUNTIES GAS CO.,** Los Angeles. Docket G-1718 for 81 miles 30-in. line between Whitewater and Desert Center, Calif., 6 miles 30-in. from Blythe, Calif. station to Calif.-Ariz. border, and two 1760-hp compressors at Blythe.

SOUTHERN NATURAL GAS CO., Birmingham, 127 miles of various size pipeline and two compressor stations totaling 11,050 hp in Alabama, Georgia, Mississippi and Louisiana.

SOUTHWESTERN VIRGINIA GAS TRANSMISSION CO., Martinsville. Docket G-2237 for 17-mile line from Transco's line near N.C.-Va. state line to Martinsville.

TENNESSEE GAS TRANSMISSION CO., Houston, 45-mile spur from Buffalo, N. Y. to near Niagara Falls, N. Y. Also 266 miles loops between Texas and New York, 100 miles of laterals, 72,000 hp to be added, and crossing of Niagara river

TEXAS GAS TRANSMISSION CORP., compressor station with 3960 hp on its main line near Shreveport. Also 642 miles main and loop in La., Ark., Miss., Tenn., and Ky.

TRANS-CANADA PIPE LINES LTD., for 2200-mile line from Alberta to major cities as far east as Montreal.

UTAH NATURAL GAS CO. to build a 360-mile line from the San Juan basin to Salt Lake City. A secondary line would run from Last Chance field (Wayne county, Utah) through Sevier and Sanpete counties.

UTAH PIPE LINE CO., Dallas, for a 392-mile line from Aztec, N. M. to Salt Lake City. Includes 374 miles of 22-in. and 18 miles of 16-in.

WESTCOAST TRANSMISSION CO. INC., Wilmington, Del., 615 miles, including 277 miles from Sumas, Wash. to Portland, Ore. with short branches to a number of cities in the two states; 266 miles south from the Osoyoos, B. C. area to Spokane and Hanford, Wash.; and 72 miles of laterals and 13 measuring stations.

Approved

CUMBERLAND & ALLEGHENY GAS CO., Pittsburgh. Docket G-1732 to build 13 miles of line in various localities, and to retire the same amount in West Virginia and Maryland.

HOME GAS CO., Pittsburgh. Docket G-1732 to build 16 miles paralleling an existing line in Steuben and Chemung counties, N. Y.

MANUFACTURERS LIGHT & HEAT CO., Pittsburgh. Docket G-1732 to build 26 miles of line, in various localities, retire 18 miles and a 125-hp station, and convert 3 miles transmission line to distribution in Pennsylvania and West Virginia.

UNION GAS & ELECTRIC CO., Bloomington, Ind. Docket G-1778 to build a 33 mile 8-in. line from Piatt county, Ill. to Bloomington, with appurtenant equipment.

Under Way

ALGONQUIN GAS TRANSMISSION CO., Boston, facilities to serve designated companies in Mass., R. I., Conn., and N. J. Includes 253 miles of main line and 279 miles of laterals.

ASSOCIATED NATURAL GAS CO., Tulsa. Docket G-1689 for 88 miles of line, town border and distribution regulator stations and distribution facilities to serve 14 towns in Missouri.

ATLANTIC SEABOARD CORP., Charleston, W. Va., for a 3520-hp station in Randolph county on its Cobb-Rockville line.

CANADIAN-MONTANA PIPELINE CO., Calgary, has Canadian Pipeline Construction Co. Ltd. at work on 18 miles of 16-in. line from Pakowki lake area in Alberta to Montana state line; 2 miles of 12-in., 12 miles of 10-in., 11 miles of 6-in. and 24 miles of 4-in. line for gathering

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CONCRETE RIVER WEIGHTS
Hold down that line with Universal River Weights (reinforced concrete clamps) whenever you cross any body of water. Two half-rounds sections clamp around pipe. No "buoying-up" or shifting with current. No rusting. Compare products and prices before you plan to lay any line. Write for literature.
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CENTRAL KENTUCKY NATURAL GAS CO., Charleston, Docket G-1666 for 18.6 miles of 12¾-in. from Winchester to Lexington, Ky.

CITIES SERVICE GAS CO., Oklahoma City, at work on 56 miles of 16-, 10-, and 3-in. line in Kansas and 13,080 hp at new and old stations.

COLORADO - WYOMING GAS CO., Denver. Docket G-1534 for lateral lines and meter stations to supply gas to Public Service Co. of Colorado, its parent; add 2400 hp at its Mesa compressor station; replace 1½ miles of its Fort Warren lateral with larger pipe; and replace 4 miles of 4-in. (Golden lateral) with 8-in.

EAST OHIO GAS CO., Cleveland. Docket G-1571. Williams Bros. at work on a 65-mile, 26-in. line from near Petersburg, Ohio, to west of Twinsburg, Ohio. Completion scheduled for Dec. 15, 1951.

EAST TENNESSEE NATURAL GAS CO., Knoxville, Dockets G-1065 and G-1517 for three laterals totaling 8 miles together with physical connections, metering, measuring, and regulating equipment.

EL PASO NATURAL GAS CO. Dockets No. G-1729 and G-1730 constructing a 1980-hp compressor station near TXL plant in Ector county, Texas.

KANSAS-NEBRASKA NATURAL GAS CO., Hastings, building 117 miles of 2⅜-, to 8⅝-in. line in Nebraska, four town border stations and laterals, measuring and regulating equipment, 50% completed. Regulations are such that completion during 1951 is problematical.

MICHIGAN GAS STORAGE CO., Jackson, has Mahoney Contracting Co. at work on 78 miles of 16-, 22-, and 24-in. line from Laingsburg Junction to near Pontiac-Mt. Clemens, 3 laterals.

MICHIGAN GAS UTILITIES CO., Coldwater, Mich. (formerly National Utilities Co. of Michigan). Docket G-1625 for 77 miles in south central Michigan. Construction started Oct. 5 south of Marshall, Mich.

MISSISSIPPI RIVER FUEL CORP., St. Louis. Docket G-1581 for development of Waterloo, Ill. storage field, 16.2 miles of line, an 1800-hp station, and other facilities.

MISSISSIPPI RIVER FUEL CORP., St. Louis, has Houston Contracting Co. at work on a 98-mile, 16- and 18-in. feeder line from Lincoln parish, La. to Woodlawn, Texas, gas field. Mississippi also building an 11-mile, 10-in. lateral to Waskom field, Texas.

MONTANA-DAKOTA UTILITIES CO., Minneapolis, 16 miles connecting lines between facilities acquired from 3 companies in Montana and Wyoming. Compressor station with two 330-hp units and dehydration facilities, together with addition of two 880-hp units to an existing station.

NEW YORK STATE NATURAL GAS CORP., Pittsburgh, Docket G-1701 for a 6600-hp station at Ithaca, N. Y. and 35.2 miles 20-in. loop from there to the Therm City station.

NEW YORK STATE NATURAL GAS CORP., Pittsburgh, has Williams Austin Co. at work on 25½ miles 16-in. from Amsterdam to Albany, N. Y., and 20 miles of 20-in. from Boom station, Tioga county, Pa. to Big Flats near Horsehead, N. Y.

NEW YORK STATE NATURAL GAS CORP., Pittsburgh. Docket G-1601. Williams Bros. Co. at work on a 77-mile, 20-in. line from Lawrence county, Pa. to the South Bend storage area, 17 miles of field lines, and a 12,000-hp station. Fish Engineering Co. is building the station.

NORTHEASTERN GAS TRANSMISSION CO., Springfield, Mass. 500 miles of line from Tennessee Gas Transmission Co.'s system near Pittsfield, Mass., and from Transcontinental's system near Greenwich, Conn. and metering and regulating facilities. To serve companies in Conn., Mass., and N. H. Includes 144 miles 24-in. from Pittsfield to Wakefield, Mass. to be built by Oklahoma Contracting Co.; and 225 miles 3- to 12-in. laterals and 35 meter stations.

NORTHERN NATURAL GAS CO., Omaha, has H. B. Zachry Co. at work adding to compressor stations at Bushton, Mullinville, and Clifton, Kan.

OHIO FUEL GAS CO., Columbus, Docket G-1639 for 61.3 miles in Sandusky, Elyria, and Dayton, Ohio areas.

PACIFIC GAS & ELECTRIC CO., San Francisco. Docket G-1709 for a 44-mile, 8⅝-in. line in Monterey county, Calif.

PACIFIC GAS & ELECTRIC CO., San Francisco, has Bechtel Corp. building compressor stations at Topock, 6 compressors totaling 15,000 hp; Hinkley, 7 compressors totaling 17,500 hp; and Kettleman Hills, 8 compressors totaling 12,320.

PANHANDLE EASTERN PIPE LINE CO., Kansas City, Mo. has Midwestern Constructors on 6000 hp at existing stations.

PUBLIC SERVICE CO. of N. C. INC., Gastonia. Docket G-1407 for 169 miles of laterals to Transcontinental and Piedmont Natural lines and 25 distribution systems in North Carolina.

SOUTHERN NATURAL CAS CO., Birmingham, building 8400-hp compressor station at Enterprise, Miss. Ford, Bacon & Davis Co. at work on 34 miles various size pipelines in Louisiana; Associated Pipe Line Contractors at work on 40 miles 24-in. line in Louisiana and Mississippi.

TEXAS EASTERN TRANSMISSION CORP., Shreveport, to boost capacity to 1205 MMcf, 791 miles 30-in. from Kosciusko, Miss., to Connells-

ROSKOTE cold-applied anti-corrosion mastic saves time...saves money...*SAVES PIPE!*

Roskote's drying speed, its handling ease and its high electrical resistivity makes it the ideal mastic for pipeline protection, winter or summer. Whether you are protecting distribution and service lines, or large transmission lines in yard or field, it will pay you to investigate . . .

cuts field costs because it is applied COLD — either brush, spray or special line-traveling machine — without primer or field mixing. It eliminates labor, equipment and hazards of hot-applied materials. It is fast-setting to a tough, flexible film of high electrical resistivity (20 megohms per sq. ft.) without brittleness or sag through a temperature range of −40° to 375°F. It dries to the touch in 20 minutes and is ready for backfill in an hour.

Roskote's resin base resists acids, alkalies, salts and moisture. It bonds readily to previous coatings of coal tar or asphalt. Wire brushing is the only preparation needed for old pipe.

Roskote's drying speed and handling ease cuts man-hours from work schedules and speeds pipe-line progress. That saves real money! Yet Roskote costs only 3¢ per square foot of coverage.

Used by over 70 utilities and pipeline companies for coating at "hot spots," road crossings, for valves, joints, meters, drips; for patching and for waterproofing concrete regulator pits.

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Write for bulletin containing complete technical specifications, chemical and electrical properties and application information. Ask for the Roskote special trial order offer.

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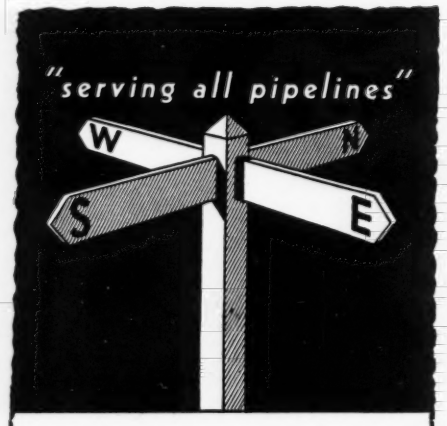
MANUFACTURERS OF QUALITY INDUSTRIAL COATINGS RESISTANT TO CORROSION BY ACIDS, ALKALIES, ELECTROLYSIS, HEAT, MOISTURE AND WEATHER.



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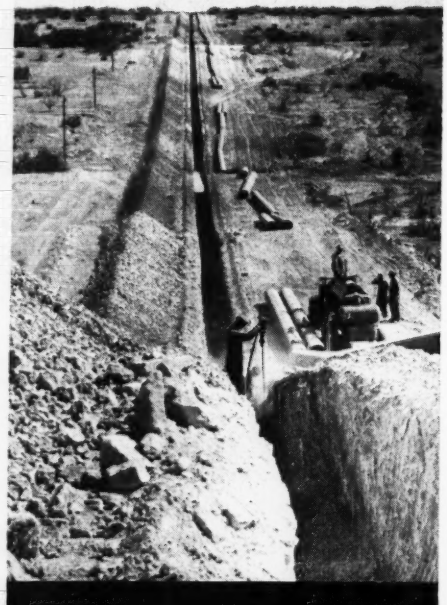
1973 WEST GRAY HOUSTON, TEXAS PHONE JU-2431

Getting rock out of ditch for a 22" pipeline in the Southwest.



HOUSTON
CONTRACTING COMPANY
General Contractors

OIL • GAS • GASOLINE • WATER PIPE LINES
LAURENCE H. FAVROT R. P. GREGORY GEO. A. PETERKIN
2707 FERNDALE PLACE HOUSTON 6, TEXAS

ville, Pa.; seven compressor stations with 46,4 hp on new line, six with 52,500 hp on existi line; short lines in New York area. Willia Brothers-Davis Co. is at work on 163.6 miles 30-in. line from Kosciusko, Miss., to the Tenne see river, and river crossing of Ohio river Ohio-W. Va. border. Mahoney Contracting C at work on 100 miles 30-in. from Ohio river Kentucky river and 35 miles of 30-in. fro Connellsville to Delmont, Pa. Eastern Pipe Line Contractors on 76 miles of 30-in. from Tenne see river to Columbia, Tenn. H. B. Zachry Co. on 73 miles of 30-in. from Columbia, Tenn. t Cumberland river. N. A. Saigh Co. Inc. on 80 miles of 30-in. from Columbia, Ky. to Kentuck river. Trojan Construction Co. on 50 miles 30-in. between Ohio river and Vanceburg, K Pentzien Inc. at work on 30-in. line und Cumberland and Kentucky river.

TEXAS GAS TRANSMISSION CORP., Owen boro, Docket 1578 building 189-mile line fro Arcadia parish to Morehouse parish, La. (24- and 26-in.) and 425 miles 26-in. loops. At 5280 hp near Madison, Ind.; 9340 hp at 4 e isting stations; underwater crossings of Oh and Mississippi.

UNITED FUEL GAS CO., Charleston, to build 4 miles in West Virginia, 2640-hp compressor st tion with dehydration plant, and transfer 1000- hp unit from Walgrove to Kanawha station. H. L. Gentry Construction Co. has contract for 32 mile of 20-in. line near Charleston, W. Va.

UNITED GAS PIPE LINE CO., Shreveport, 3 miles 16-in. from Baldwin county, Ala., to Es cambia county, Fla.; two laterals to Saufley field Also tap and sales meter stations.

UNITED GAS PIPE LINE CO., Shreveport, 100 miles in Texas, Louisiana, and Mississippi. In cludes 504.7 miles 30-in., 6 miles 26-in., 5 miles 24-in. from Agua Dulce field in south Texas to Monroe, La.; about 245 miles of 30- 26-, 24-, and 20-in. from Gulf of Mexico north east to Jackson, Miss.; 59.6 miles from this li to near Kosciusko, Miss. Contracts have bee awarded to Brown & Root Inc., Houston, for en gineering, construction, and other services and t Gulf-Southern Contractors, Fort Worth, for othe major work on the project. In offshore fields Gulf of Mexico: 12.3 miles 14-in. line. H. C Price Co. has signed a contract for the Somati coating of 137 miles of line to be laid in south central Louisiana. Also under way are 68.1 mile of 16-in.; 25½ miles 6-, 8-, 10-, and 12-i gathering lines from fields in Plaquemine parish, La. to New Orleans.

UNITED NATURAL GAS CO., Oil City, Pa Docket G-1614 for 89,530 ft of line and appurte nant facilities and 21,120 hp in a new station i Hebron field, Potter county, Pa. Joint proje with Tennessee Gas Transmission Co.

Contracts Let

OHIO FUEL GAS CO., Columbus, to H. L. Gentr Construction Co. for 26 miles of 20-in. line fro Wellington to Elyria, Ohio.

WESTERN GAS CO., Butte, to Engineers Lt Pipe Line Co. for 53 miles of 16-in. line fro Canadian border to point near Cut Bank, Mon

Pending Construction

GRAND VALLEY PIPELINE CO., Denver, a 10 mile, 8- and 10-in. line from Piceance creek t Grand Junction and Rifle, Colo.

LAKE SHORE PIPE LINE CO., Cleveland, Ohi 45-mile, 10¾-in. line from Meadville, Pa. t Ashtabula, Ohio. Work to begin in 1952.

NEW YORK STATE NATURAL GAS CORP., Pittsburgh, to Pipe Line Construction & Drilli Co. for 23½ miles of 16- and 20-in. line fro Preston station near Waynesburg, Pa. to Colv Gate, Washington county, Pa., and 4½ miles 20-in. from Murrysville Gate to Tonkin pum station, Westmoreland county, Pa.

NIAGARA MOHAWK POWER CORP., Syracuse under Docket G-1475, a 55-mile 10¾-in. li to supply Watertown and other communities.

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IF YOU ARE NOT A REGULAR SUBSCRIBER TO **GAS**

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Jaeger's "new standards" give more air to do 30% to 40% more work

Model 600 Jaeger Compressor (600 cfm at 100 psi) operates these two 4" wagon drills at full pressure drilling 30% to 40% more footage per hour than with any 500 cfm compressor. Jaeger's 15% to 25% higher "new standards" provide the air you need to hold full pressure behind tools that otherwise would loaf under weak 70 lbs. pressure—or operate additional tools where speed and striking power are not required. See Catalog JC-1.

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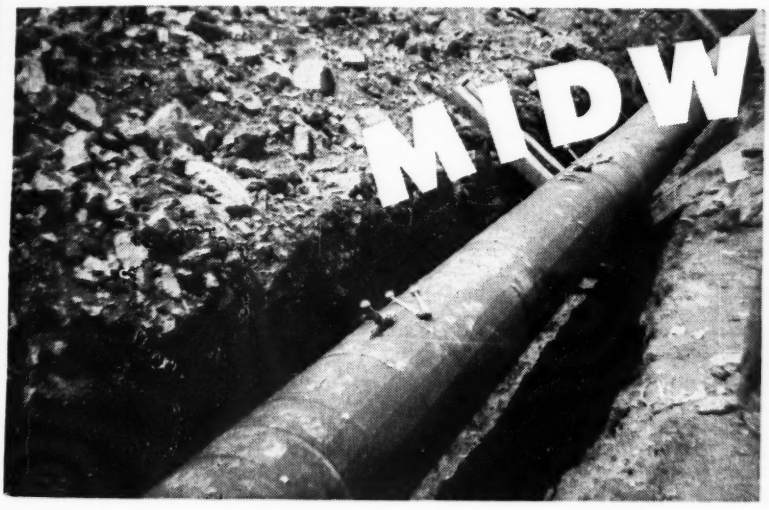

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KAPCO WILL SAVE YOU TIME AND MONEY ON THE LINE

KAPCO Rock Shield, a protective shield for pipe and pipe coating has undergone vigorous field tests. Dense limestone rocks have been dropped from a height of five feet directly on the shield and still the electronic detector showed no holidays in the coating. This protective shield eliminates the need for padding the ditch and has also been used with a high degree of success at river and road crossings, padding under river weights, pipe anchors and elsewhere where the coating is subject to damage in handling. Rock Shield is available for early delivery from Midwestern. Manufactured exclusively by the Keystone Asphalt Products Co. — a division of the American Marietta Company.

- For protecting pipe and coating in rocky areas; replaces costly dirt padding.
- Fast and easy to apply, cuts time in difficult areas.
- No expensive equipment needed for application.
- For use whenever and wherever pipe and coating are subject to rough handling.

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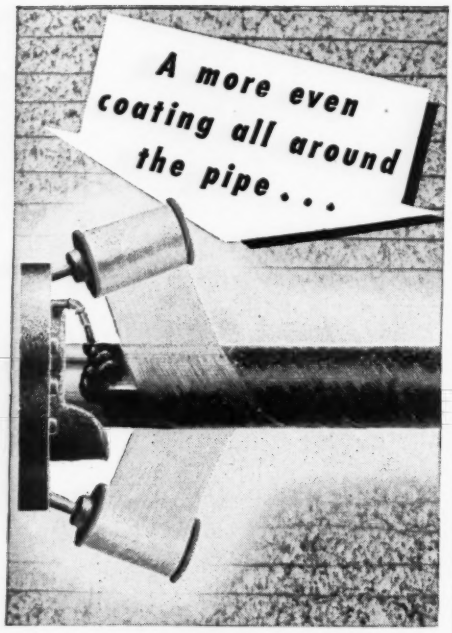

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UNDERGROUND PIPE WRAP

Pipe coatings wrapped with VITRON Wrap don't have a chance to sag. A moment after the coating is applied to the pipe, the Wrap is pulled in under tension.

The coating bleeds through the highly porous VITRON, sets firmly, and assures a more even coating all around the pipe. Holiday-forming gases can easily escape.

VITRON reinforcing means longer life for your pipe coating.

High reinforcing strength of VITRON Wrap resists damage from impact and soil stresses, and retards cold flow of coating.

VITRON Wrap is made of known composition glass of tested durability, unaffected by application temperatures.

VITRON Glass Fibers absorb no moisture; help maintain a high dielectric rating.

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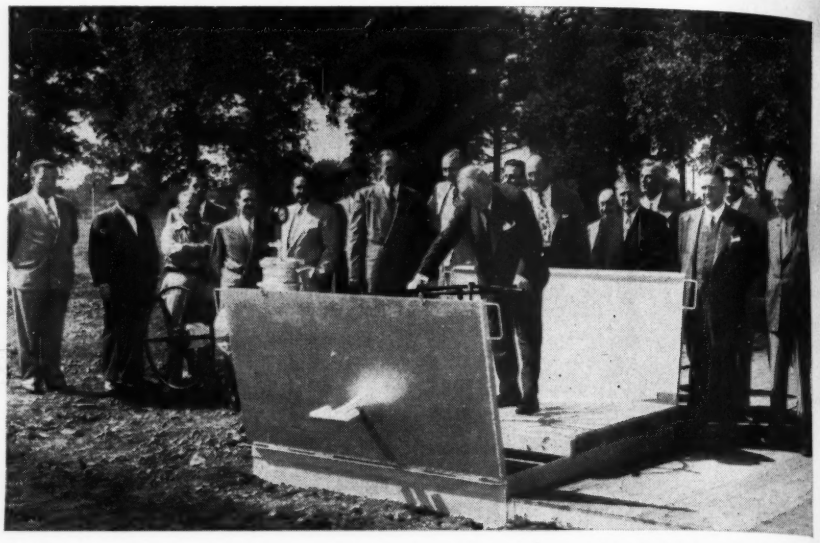
UNDERGROUND PIPE WRAP



W. G. Maguire spins valve to start deliveries of Trunkline gas into Panhandle system at Tuscola, Ill. Third from right is Hy Byrd, Trunkline president, and behind Mr. Maguire, to his left, stands Edward Buddrus, president of Panhandle Eastern.

More Gas for Panhandle

Trunkline Carrier Goes Into Service

Gas-hungry customers of Panhandle Eastern Pipe Line Co. had good reason to cheer, when, on Oct. 1, W. A. Maguire, chairman of the big supplier, cracked a valve at the Tuscola (Ill.) compressor station, signalling the completion of the $80 million, 1300-mile Trunkline Gas Co. pipeline.

On that day, Trunkline began feeding into the line of its parent company 250 MMcf at the Tuscola interconnection. Completed 30 days ahead of schedule, and thus in plenty of time to ease the winter peak strain, the big Texas-to-Illinois carrier was the major factor in bringing Panhandle's system capacity from 500 MMcf to 850 MMcf per day.

The new line also gives Panhandle access to a new and unrelated source of gas reserves. Heretofore, its principal resources have been concentrated in the Hugoton and Panhandle fields of Texas, Oklahoma, and Kansas. Trunkline's system draws from as far south as the McAllen field, near the southern tip of Texas.

Additional gas reserve insurance is afforded by the route of the Trunkline system, of which 500 miles lies in potential or producing territory.

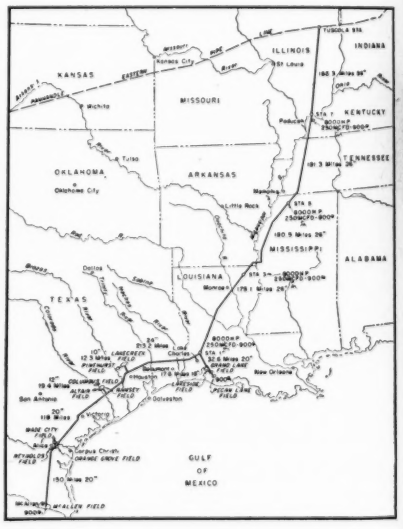
Four compressor stations with an aggregate of 32,000 hp move the gas through the 24- and 26-in. line. The smaller diameter was used from McAllen to Lake Charles, La., where the 26-in. takes over.

Nearly 7 million persons will benefit, either directly or indirectly, from the new line. Panhandle serves six midwest states—Kansas, Missouri, Illinois, Indiana, Ohio, and Michigan. Cities as far east as Cleveland and Flint and Saginaw, Mich., are numbered among Panhandle buyers.

Trunkline controls more than 2 trillion ft, giving Panhandle a total in excess of 9 trillion. That's good for 25 years based on present combined capacities.

Trunkline, which has principal offices in Houston, received FPC certification in May 1950, began right-of-way clearing July 24, 1950. Kaiser Steel provided 250,000 tons of steel for the pipe, which was fabricated by Basalt Rock Co. at Napa, Calif.

An indication of the magnitude of the construction problems which had to be faced was the number of major river crossings. Ten large rivers, plus numerous creeks, had to be spanned. Submarine crossings were used, with two 24-in. lines, specially weighted, being laid under all major rivers.



System map of Trunkline Gas Co. shows its origin at the southern tip of Texas and its terminal in Illinois.

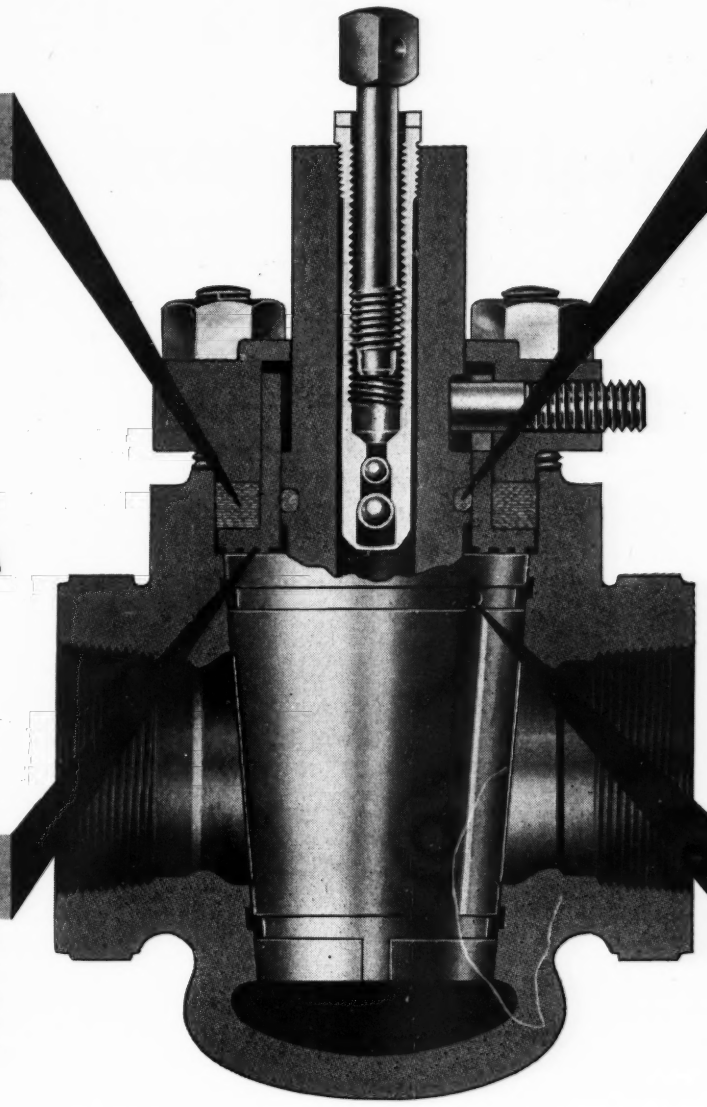
PORTER Lubricated PLUG VALVES

Generous size RESILIENT PACKING

permits initial compression. Completely enclosed in non-rotating metal—it's free from all moving parts insuring longer life.

O-RING,

under initial compression, seals against inner and outer surfaces preventing leakage past shank of valve.



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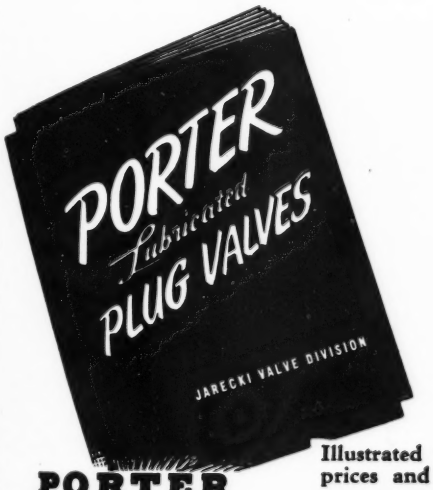
"LABYRINTH" SEAL

between bottom of gland bushing and top of plug face. This grooved design provides a much more effective seal than that obtained by a single surface.

Two vertical LUBE GROOVES 180° apart,

and two connecting horizontal grooves. With the Porter design, the products being handled never come in contact with lubrication grooves.



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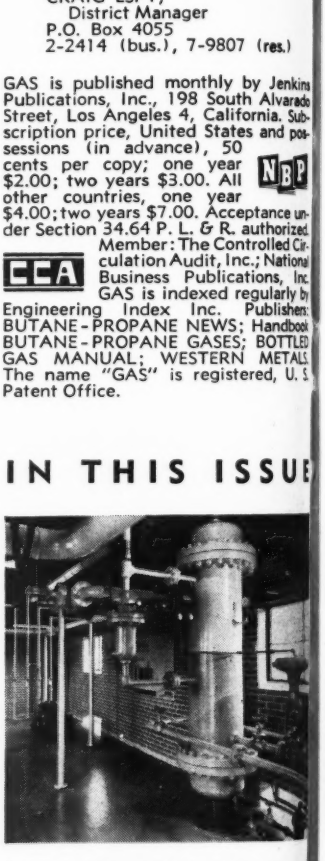

A new approach to propane-air mixing and flow control is incorporated in the peak shave plant at Columbus, Ga. Photo shows the vaporizing and mixing compartment. For a complete story on the plant, see pp. 36-37.